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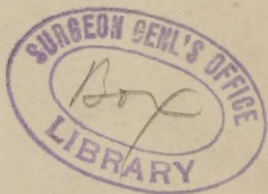
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SYMPTOMS, CAUSES AND TREATMENT

PHILOSOPHICALLY CONSIDERED.

BY

J. P. BATCHELDER, M. D.



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NEW-YORK:

HENRY G. LANGLEY, 5 ASTOR HOUSE,  
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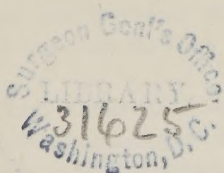
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# SYMPTOMS, PHENOMENA, AND EXCITING CAUSES

OF

## INFLAMMATION.

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So much has been written on inflammation that it may be deemed quite superfluous to present to the medical public any additional remarks, but having seen no pathological views, from which the indications of cure, and the *methodus medendi* seemed to flow as natural, regular and legitimate deductions, the writer proposes for consideration, a theory which he hopes may contribute to remedy that defect. Whether the endeavor will be crowned with success, or the views presented meet with any favor, other than a candid examination, is to him quite problematical.

### THE SYMPTOMS

of inflammation are redness, swelling, pain and heat. "*Rubor et tumor, cum calore et dolore*" in the pithy language of Celsus.

Although the assemblage is sufficiently characteristic of the disease, yet no one of the group can be considered pathognomonic. Increased heat, as a positive quality, is only a contingency, or an occasional concomitant, and therefore, we shall regard it simply as a mere sensation, and trace out the laws by which it is governed in that relation.

1. Redness arises from an increased determination and admission of blood into the vessels of an inflamed part, and particularly such as in a state of health circulate colorless fluids. This color is not always very apparent in the early part of the disease; but becomes more and more conspicuous during its progress. We look upon it as the most important symptom;—indeed, we deem it essential; for upon it, or rather its cause, all the other phenomena depend. Although sometimes present without inflammation, yet it is believed that inflammation cannot exist when it is absent. By the degree of

redness we may judge with considerable accuracy of the stage, rapidity and violence of the disease ; the color of a part being a pretty sure index to its circulation.

#### TUMEFACTION, OR SWELLING.

2. To a certain degree swelling occurs in all inflammations, internal as well as external, although not so apparent in the former as in the latter. Like increased redness, it is generally proportionate to the intensity of the disease, but is, however, much modified in that respect by the greater or less density of the part affected.

An over-distention of the capillary vessels is the first link in the chain of causation. As the capillaries like the hollow viscera, have no power of distending themselves, the manner in which they become distended, or over-distended in inflammation, may be more properly considered when we come to discuss the *modus operandi* of the causes of that affection ; we shall therefore assume for the present that by the influence of those causes, the capillaries of a part are induced to forego their resistance, and that consequently, in accordance with the principle in hydraulics, that fluids move in the direction in which they meet with least resistance, more blood will flow into them, and continue to do so until they become distended, and, in fact, over-distended, in proportion to the diminution of their resistance and the intensity of the *vis a tergo*. When this over-distended state has continued for some time, the pores which are analogous to the sphinctered outlets of the larger organs, like them, under similar circumstances, relax and allow the fluid contents to pass ; hence the effusion of serum, albumen and coagulable lymph, which is the second link in the chain, and constitutes the main cause of the tumefaction.

Now the right performance of the function of a capillary or hollow viscus, having an outlet, depends as much upon its mouth or pore as upon the vessel or viscus itself : in other words, to perform the function properly, there must be a just equilibrium between the force with which the vessel or viscus contracts and that with which the pore or sphincter resists. When the distention is only moderate or normal, the vessel acts gently, the pore relaxes, and effusion or transudation ensues. For example :—when the cutaneous capillaries are only normally distended, we have neither more nor less than insensible perspiration ; and this degree of distention we designate by the figure 3 ; if the distention be increased to 4, there will be sensible perspiration ; if to 5, copious sweating ; if to 6, the skin will

be dry and hot; the sphincters or pores holding tight in consequence of the over-distended state and violent contractile efforts of the cutaneous capillaries, in which respect the analogy between them and their pores and an over-distended bladder and its sphincter holds.\* Be it remembered, that this distended state of the capillaries of a part constitutes one of the items, a small one it is true, which go to make up the tumefaction; but the effusion of serum, albumen, fibrine, and sometimes blood, are the principal causes.

How does this effusion take place, and by what law is it governed or regulated? We come to the principle. If from any cause the capillaries be suddenly or violently distended, or over-distended, and consequently prompted to act violently, or inordinately, as in inflammation, the pores, like the sphincters of the bladder or anus similarly circumstanced, act or resist no less violently and inordinately, and consequently suffer no fluid to escape; and this we conceive to be the precise state of the vessels and pores in the incipient or early stages of that disease, and is analogous to that of the vessels on the surface during the hot stage of an intermittent, in which the skin is dry.

At this period, there is no other swelling than that occasioned by the distended state of the vessels of the part. There is no effusion of serum; none of fibrine. There is mere congestion. How is the effusion produced? The vessels, over-distended—the pores, constricted and resistant. How then, we repeat, is the effusion produced? The principle is this, that rest shall succeed to action. This law results from necessity and is consequently universal, reaching and controlling all vital movements; hence, vascular contraction is followed by the spontaneous relaxation to which we have alluded, and which generally, is in proportion to the previous contraction. Therefore, in obedience to this law, the pore or sphincter, (see the preceding note,) as the case may be, which has been for some time resisting powerfully and completely, the inordinate action of the vessel or viscus, and of course preventing the transmission of the fluids by which the latter (the vessel or viscus,) were distended, now in its turn foregoes its resistance, relaxes and allows the effusion of serum or fibrine

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\* In an over-distended state of the bladder, from long-continued retention, its sphincter often relaxes, (not, however, until the expulsive efforts [the *vis a tergo* in this case] of the organ abate) and incontinence ensues; a circumstance which not unfrequently misleads the unwary practitioner, and induces him to forego the introduction of the catheter, the only sure remedy for the retention which still continues, and may cause the bladder to ulcerate, and the unfortunate patient to lose his life.

to take place into the inflamed part, or perspirable matter over the whole surface as in the sweating stage of an intermittent. In both cases, the over-distended vessels are thus relieved. The final end of this effusion is to empty the vessels; in other words, to cure the disease. This is the method of nature and also of art; a fact of which the practitioner should never lose sight.

If this want of equilibrium between the vessels and their pores continue but for a short time and the effusion be but slight, resolution is said to have taken place, which is one of the terminations of inflammation mentioned by systematic writers; but with all due deference, we are disposed to consider the effusion by which the vessels are emptied and relieved, as the only legitimate termination of that disease; if indeed we except gangrene.\* If the state of distention continue several days, the effusion may be considerable and of a mixed character; as serum, albumen, coagulable lymph or even blood. It constitutes the principal or main cause of the swelling, the second symptom. We are, however, ready to admit that want of absorption and the generation of new vessels, tend in some degree to augment the tumefaction, and here it is proper to remark that the formation of new vessels is often exceedingly rapid, which with the secretion of pus, has been reckoned among the causes of swelling, and therefore, we shall proceed briefly to consider them.

Let us inquire, *in limine*, why are these new vessels formed? and why is pus secreted? The effused fluids, if too great in quantity to be absorbed, will remain an incumbrance greatly interfering with, or wholly suspending the function of the organ or part; therefore, to get rid of them, the suppurative process is instituted by nature in the simplest manner possible; to wit, by the formation of new vessels and consequent organization of the effused lymph. The secretion of pus then is the final end of the formation of new vessels. How are they formed? On this point we shall hazard a conjecture, which, like the theory promulgated in this paper, was framed many years ago; that a globule of blood escapes from a vessel, probably the same which furnished the lymph, through which it (the globule)

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\* When inflammation terminates in gangrene, the over-distended capillaries "resist unto the death." On the contrary, we may have gangrene from an over-constricted state of the capillaries, as in the gangrene of old people; also in that from interrupted circulation, &c. &c. This constitutes the dry gangrene of authors and is not preceded by inflammation. In the first instance the vessels resist until they lose their vitality. In the second they contract until they die. The resistance and the contraction are both painful, and are followed by the same result.

makes its way, and thus forms a channel along which other globules following close and in rapid succession, pass and continue to move until the track becomes a vessel;—similarly-occurring results take place on every side;—globules after globules escaping from other vessels, pass in all directions, till channel runs into channel, and globule joins globule, when they will move in that direction in which they are most forcibly impelled by the *vis a tergo* which continues to urge them along, until the channels are converted into living vessels, temporary or permanent, according to subsequent circumstances. If the newly-formed vessels, or the old ones, which according to some have become elongated and made their way into the effused lymph, unite so as to carry on the circulation in that substance, thus vascularized and organized, the inflammation is said to have terminated by adhesion, which according to our doctrine is incorrect; but when the quantity of coagulable lymph, or of other fluids, is too large to admit of this kind of inosculation, the adhesive process fails altogether, and the suppurative is instituted, and pus secreted for the purpose already stated. But how is pus, which is said to be “altered blood,” formed? How is the blood “altered?” Where are we to find this modifying—this altering power? What are the agents by which the suppurative process is commenced, carried on, and consummated? It is believed that the capillaries wherever situated, whether in the areolar tissue, the serous or mucous membranes, or on the surface of the body, or a wound, will secrete pus whenever they become invested with a coating of coagulable lymph, and that this is the main, if not the only contingency required for altering the blood, and changing it into pus. Upon this principle, the primitive vessels, if elongated into the adventitious lymph, will secrete pus. But the business, so far as an abscess is concerned, is probably done chiefly by the newly-formed vessels, which are little other than imperfectly animalized tubes, that can exert no other than a mere altering influence upon the blood, which converts it into pus.

The first function then, of the newly-formed, or the elongated portions of the primitive vessels, when prevented from inosculating by the quantity of lymph, is the secretion of pus.

According to the theory advanced, the disease terminated with the effusion which emptied the vessels; therefore, suppuration is to be considered neither a termination of inflammation, nor a cause of tumefaction, as a symptom.

## PAIN.

3. The third symptom of inflammation is pain ; the cause of which does not appear to have been explained in a very satisfactory manner. It was supposed to be owing to the swelling which put the nervous fibrillæ in the inflamed part upon the stretch ; but opposed to this is the fact, that the pain and sensibility are often not at all commensurate with the degree of tumefaction : for we frequently find a part under inflammatory circulation exceedingly sensitive when there is little or no swelling ;—and also, a part very much swollen, as in dropsy, without either pain or increased sensibility ; the latter is, indeed, sometimes diminished, although the nervous fibrillæ are greatly stretched. Pain, in all cases, without a single exception as we believe, arises from one of two causes : an over-constricted, or an over-distended state of the vessels. The latter is their condition in inflammation ; and the pain which results from it precedes the tumefaction from effusion. On account of the importance of pain as a symptom of inflammation, and the practical inferences to be drawn from it, we shall examine whatever relates to it with considerable care. In accounting for this symptom, the influence which red or arterial blood (we use the terms synonymously) has in exalting the sensibility of a part, seems to have been disregarded, or entirely overlooked ; but it appears to the writer of sufficient moment to be entitled to consideration, and, therefore, he risks the observation that this connection between the sensibility of a part and the quantity of arterial blood circulating in it, is believed to be so strict and invariable that no portion of the body through which red blood circulates, is wholly insensible ; and that no part destitute of red blood is endowed with sensibility ; and furthermore, that this holds as well in the morbid as in the healthy condition of parts—a consideration that greatly enhances the value of the doctrine. It may therefore be laid down as an axiom in physiology and pathology, that whatever diminishes the influx of red blood into a part, or forces it out, produces a corresponding diminution of its susceptibility of impression. Fear and cold, by causing the contraction of the capillaries on the surface, and consequently forcing the blood out of them, diminish its sensibility ; hence the torpor and insusceptibility of impression which so uniformly accompany their influence. Joy and warmth, by relaxing the vessels, and the consequent admission of red blood, increase the susceptibility of impression. Cordials taken into the stomach produce the same effect. If, in a doubtful case, we

wish to determine the hardness of the pulse, or the existence of matter in an abscess, we almost instinctively rub the fingers, or hold them near a fire in order to exalt their sensibility of touch by soliciting to them a greater quantity of blood. It is needless to multiply proofs that the sensibility of a part is very closely connected with, if not absolutely dependent upon the quantum of blood circulating in it, for every one must be acquainted with the fact, that the nails, hair, bones, cartilages, fibrous membranes, &c., which, in their normal state admit no red blood, are devoid of sensibility.

When the capillaries of a part are distended beyond their healthy condition, resistance is excited, and an effort to expel the distending fluid ensues, both of which circumstances are productive of pain, which, upon the principle laid down, is greatly aggravated by the presence of arterial blood, which has exalted the sensibility. Again, when the capillaries are contracted much below their normal or healthy standard, this over-contraction, like the over-distention just mentioned, is also the cause of pain. In fact, these opposite states, when extreme, produce sensations so nearly alike that it is quite difficult, especially when an internal organ is involved, to diagnose between them without adverting to collateral circumstances.\*

This third symptom, pain, is not only a matter of deep concernment to the patient, but of much consequence to the practitioner, when rightly and properly understood; for it greatly assists him in determining what particular tissue or structure is affected. In health, every function is performed without exciting pain, uneasiness, or even consciousness of action; when, therefore, either is experienced, the sensation resulting from perception of change indicates disorder or disease. Now, similar changes can take place in similar structures only;—pain or feeling being the perception of change, it likewise follows that similar feelings can be experienced in similar structures only; and dissimilar feelings in dissimilar structures only;—different sensations always indicating different organisms. Now, the mechanism of every structure is peculiar to itself; consequently each tissue must have its own peculiar mode of acting, and of course its

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\* The most serious consequences have often ensued when these affections have been wrongly diagnosed, which might have been readily prevented had the question, whether the pain and other symptoms arose from an over-contracted or an over-distended state of the vessels of the part, been fairly put, duly considered, and fully answered. This matter, though important, and intimately connected with our subject, must be passed over with this brief allusion, which will be comprehended by every practitioner of experience.

own kind of feeling. The final end of this arrangement is probably conservative, for we observe that the feeling of each part is that which is elicited by causes adapted to derange its function, or disorganize its structure, the uneasy sensation prompting us to procure their removal.

The fact that a great number of feelings, which have been supposed to arise from the peculiar properties of the external cause or agent, may be produced without any external agent or cause whatever, goes to prove most conclusively, that the immediate object of perception is the vital change in the organ itself rather than the physical action of the cause applied; therefore, it is quite immaterial to the surgeon, or practitioner of medicine, so far as the location of the change is concerned, whether an external or an internal cause be the agent by which it is effected. As we cannot now go into an argument to prove that feelings are necessarily modified by structure, we shall only allude to the fact that the same sensation may be produced by many different physical causes, which can be explained in no other way than by supposing that the action which results from their agency is so modified by the structure of the part that it (the action) is and must be the same in each particular instance, hence the same sensation is produced. Nausea, for example, is excited by emetic drugs of quite different qualities; and a great variety of other physical agents, and very often in the absence of all such causes; by the mere action of the stomach, as in inflammation of that organ, or even a blow on the head, by sailing, whirling, or by mental emotion, yet the sensation is the same, however variant the cause; and we know where to locate the derangement, because the stomach, from its peculiarity of structure, is the only organ in the body calculated to experience that sensation. Besides the mechanism of an organ as a whole, by which it is suited to perform its destined functions, there are, it should be recollected, various textures which enter into its composition, and which, if they could be acted on singly, without any other being affected, would always give rise to the same sensation. For instance, if there be inflammation in any part of the alimentary canal, and the patient complain of a sense of burning, we locate the disease mainly in the mucous membrane;—of a griping pain which goes and comes, we infer that the muscular coat which contracts painfully, and relaxes spontaneously, is involved;—of sharp, shooting or lancinating pains, we are quite sure the disease has extended to the peritoneal covering of the intestine, because those are the sensations peculiar to serous membranes. These several tissues are so intimately connected, that one can seldom be much

affected without causing disorder in the others, which may be so much more intense in one than in the rest as to obscure the sensations peculiar to them. Again, take ophthalmia as another example :—if the patient complain of a feeling as if a particle of sand were in the eye, we know that the seat of the complaint is in the conjunctiva ;—of spasmodic pains, we infer that the muscular tissues about the organ are in trouble ;—of a sense of constriction or of resistance, it is a sign that the sclerotic is involved ;—if there be great sensibility to light, we suppose that the retina, and perhaps the choroid also, are in the same predicament. If the phlogosis be in the skin, we shall hear of itching,\* smarting, increased heat, or burning ;—if in the muscles—of the sense of fatigue, of cramps or spasms, which indicate inordinate or convulsive action ; symptoms which are so common in fractures, and not unfrequent in inflammatory rheumatism ;—if in the ligaments—of the sense of contortion or distortion ;—if in the stomach—of burning pain and nausea ;—if in the bowels—of griping, &c. ;—if in the rectum—of tenesmus ;—if in a bone—of ache, the only sensation peculiar to the osseous structures ; if that ache resemble the toothache, we judge that the medulla or its membrane is implicated ;—if accompanied with a tensive feel—that the periosteum is complicated ;—if with a sense of weariness or lassitude—that the difficulty has extended to the muscles. If the disease affect the fibrous membranes, which are inelastic, there will be the sense of constriction or of tightness ; for instance, when the dura mater is affected, the patient will tell you, if particularly asked in relation to this point, that the feeling is that of constriction within the skull and about the brains, as if they were tied up in something ;—or, when the pericranium is affected, that the sensation is as if a handkerchief were bound tightly about the head ;†—or the pia-mater or arachnoid—that the pain is lancinating, shooting ;‡—streaming, electric-like pains belong to the nerves of animal life, a fact so no-

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\* This sensation (itching) is never experienced except when the cuticle is concerned, hence it is always a sign that a wound or ulcer is healing. When the patient complains that the sore itches, the intelligent surgeon knows that cuticle is beginning to form on its margin.

† The sensations ascribed to the above-mentioned membranes often arise from directly opposite conditions of their capillaries. In sick headache, and the cold stage of an intermittent, those vessels are constricted ; in the hot stage, and in inflammation, they are over-distended.

‡ Although the pia-mater and arachnoid are not fibrous membranes, yet I chose to mention them in this connection, on account of their being so generally involved in the same category.

torious, that no practitioner of the present day would venture to locate the pain of *tic-doloureux* in any other part than a nerve.

The final end of this variety of sensation appears to be, as suggested, the welfare and protection of the organ or structure in which the feeling originated; otherwise, what would prevent us from carrying exercise to an excess which would destroy the muscles, if the sense of fatigue, which is peculiar to them, did not remind us of the propriety and necessity of suspending our efforts? Or what would save us from starvation if the physical and physiological changes in the state of the stomach did not excite the sensation of hunger? How should we know that a joint had been sprained or dislocated if the ligaments did not experience the sense of distortion, which is peculiar to them.

#### INCREASED HEAT.

4. The fourth symptom, increased heat, is by no means essential, or even concomitant. Although in external inflammations, the temperature, as measured by the thermometer, almost always exceeds that of the surrounding parts, it is now very generally conceded that it seldom, if ever, transcends that of the blood in the heart, and is never commensurate with that indicated by the feelings of the patient. When secreting surfaces are inflamed, there may be the sensation of increased heat, with no actual increase of temperature, unless the disease is so severe as to stop secretion. Regardless, then, of temperature, we shall consider this symptom as a mere sensation.

Now the sensations of heat and cold appear to be almost entirely confined to the external surface of the body, because that alone is subjected to changes of temperature which might be detrimental. If those sensations be felt at all in deeper-seated parts, it is with vagueness and indistinctness; for in them they would be superfluous; because the object, let it be remembered, is not the caloric entering or leaving the body; but the perception of physical change in the part, hence the application or abstraction of caloric, the appropriate physical cause of those sensations is not at all necessary to their production; they may be produced by any cause whatever which occasions a distention or shrinking of the capillaries of the skin, the part most liable to be affected by the excess or defect of caloric, and therefore designed to experience the sensations of heat and cold. From these premises, the conclusion is drawn that this fourth symptom of inflammation is seldom present unless the skin or mucous membrane in its immediate vicinity is involved, and that it always indicates a distended or over-distended state of the capilla-

ries of the part, and gives intimation that changes are going on in the tegumentary structures which interfere with their functions, or threaten their integrity.

#### OF THE EXCITING CAUSES.

Inflammation is produced by external agents acting mechanically, chemically, or physically upon any part of the body; or by causes affecting the whole system; or it may arise spontaneously—that is, without any apparent cause. We shall endeavor to trace out the connection between the causes and the phenomena; in other words, to explain the manner in which the former operate in the production of the latter, and the principles upon which their operation depends, and also to show, if we can, that the facts and the theory harmonize. In the explanation of the symptoms it was argued that the redness proceeded from the admission of red blood into vessels which previously circulated colorless fluids only; that the tumefaction arose in part from distention of vessels; but mainly from the effusion of serum, albumen, fibrine and occasionally of blood; that the pain, modified by the structure of the part, and heightened by the influence of arterial blood, resulted from the distention and over-distention, and consequent resistance of the capillaries; that the sensation of heat which was present only when some portion of the skin or internal tegument was involved, was occasioned by an increased determination of blood, to one, or the other of those tissues by which their capillaries were over-distended, the state common to all vessels, subjected to the disease.

1. How in accordance with the doctrine promulgated is this distention or over-distention of the capillaries, the *fons et origo*, the *sine qua non* of all the phenomena of the disease produced by causes acting mechanically, chemically or physically? The blood, incompressible as water, moves through the arteries by an impulse from the heart, and makes an impression at the same instant like a solid upon the capillaries in every organ, that is somewhat in proportion to its own momentum and their resistance, which (resistance) in health is supposed to be equable throughout the system, therefore, a due equilibrium between the impulse and the resistance is maintained; but if a cause be applied which takes off, or diminishes the resistance of the capillaries in any part, the blood, like other fluids, moving in the direction in which it meets with least resistance flows in and distends those vessels, which forego their resistance and consequently cease to oppose its admission even if the action of the heart be not increased; but if it be, the impetus will be necessarily aug-

mented; and the distention in the same proportion greater and more rapid. In what way do causes of this class act so as to take off the resistance of the capillaries in any part; or induce them to lessen their resistance and suffer themselves to be distended, or over-distended? The fluids contained in the capillaries, constitute the natural stimulus, which prompts them to action or resistance.\* When the vessels are healthy and their contents natural in quantity and quality, action and reaction, are duly balanced and every function normally performed. Now, then, it is an axiom in medicine, which has obtained since the days of Hippocrates, with whom it probably originated, and is acted upon by every practitioner in his daily walks, that the stronger effaces the weaker impression. If, therefore, an impression be made mechanically, chemically or physically upon a part which is stronger than that made by the fluids on the inner surfaces of their containing vessels, the latter will, in accordance with this axiom, which is in fact a law of system, cease their resistance, and yielding, suffer themselves to be distended, over-distended, and stretched, until they are excited to resist and that painfully: and as most of the exciting causes of inflammation belong to this class, and are of a painful character, their *modus operandi* is accounted for in that way.† We repeat, the impressions made by all or nearly all the causes of inflammation are painful and also external to the vessels of the part on which they act; therefore, upon the principle laid down, they induce those vessels to relax and suffer themselves to be distended. If the cause be sufficiently powerful and the relaxation sufficiently extensive to bring the vessels of the heart into an analogous sympathetic relaxation; or in other words, to induce the capillaries of that organ to do what has been done by those of the part to which the cause has been applied, i. e. relax and admit more blood into its texture by which it, as a whole, is stimulated to increased action, the pulse will become stronger, more frequent, full and perhaps hard, and the blood be sent with greater force to all parts of the body; but finding less resistance in that, to which the exciting cause has been applied, much more will be forced into it, and its vessels in

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\* Upon this principle, rests the whole doctrine of counter-irritation. If the external irritant make an impression, or excite an action, stronger than that going on within the diseased part, relief may be expected to follow. If otherwise, the symptoms, especially the pain, will be aggravated; the rules to be observed in order to secure the desirable result, cannot be considered in this place.

† If the cause or agent be of an opposite character and make a pleasant or an agreeable impression, provided it be stronger than that made by the fluids within the vessels, the result will be the same.

the same ratio over-distended and stretched, and the inflammation more perfectly developed and aggravated. If the vessels of the heart do not sympathetically relax and that viscus do not, in consequence, act with increased energy, there may be congestion only : hence the same cause may produce congestion in one case and active inflammation in another. Upon this principle we explain the fact that genuine inflammation so often succeeds to simple congestion.

## 2. Causes affecting the whole body.

We have stated that the capillaries receive at the same instant, over the whole body, the impression of the blood sent by the heart, and that they, being the antagonists of that organ, exert simultaneously in every part an equable resistance to that impression, and that in this way the uniform distribution of the circulating fluids is maintained. How then is this equilibrium disturbed by causes affecting the whole system so as to induce inflammation ? Cold and malaria belong to this class and excite a general contraction of the capillaries throughout the entire body, which is followed by a spontaneous relaxation commensurate in extent and degree with the previous contraction ; if under such circumstances any organ or part from predisposition, hereditary taint, disease, injury, age or sex, be weaker than the rest of the system, its vessels, having less power of resistance, will yield and be over-distended, an effect which will be greatly enhanced by the increased energy with which the heart will act in consequence of its own capillaries having simultaneously with those of the other organs relaxed and of course admitted more arterial blood into its very textures as well as into its cavities. This class of causes sometimes act upon another principle. If the cause, extensive and powerful, be applied to the surface, the vessels of some internal organ, in obedience to the law that the stronger impression effaces the weaker, may relax and become over-distended and inflammation follow, although it may not supervene until several days after the application of the cause which has disturbed the harmony of the circulatory system. Every practitioner's experience will suggest instances in exemplification of this principle.

3. Inflammation may arise spontaneously ; or without any apparent exciting cause.

In such cases, which are quite rare, there is weakness or great readiness in the capillaries of some part to relax and yield to the distending influence of the fluid, which they contain ; hence causes which are not sufficiently strong to excite consciousness of action in

the mind of the patient or attention of the physician or friends, are, nevertheless, capable of disturbing the equilibrium between the distending and resisting forces of the vessels ;—and by the subsequent yielding of the latter, more blood is continually admitted until they become over-distended and resist painfully, when all the phenomena of inflammation follow in train. I have not had time to pursue this branch of the subject further ; nor do I deem it necessary, and shall therefore dismiss it with the remark, that organs to which, in the economy of the system, a greater quantity of blood is sent, are for the time being more subject than other parts to inflammation induced in this way.

#### OF THE PROXIMATE CAUSE OF INFLAMMATION.

By the proximate cause we mean : “ That phenomenon in the body or part, most immediately preceding the state which we call disease ; and without which previous phenomenon the disease is not known to exist.” \* Two theories relating to the proximate cause of inflammation have been promulgated, which are diametrically opposed to each other. On the one hand, it has been urged that increased action is the proximate cause : on the other, diminished action ; and in the maintenance and vindication of both there has been no lack of zeal, ability or ingenuity, on either side.

In reference to the first we respectfully ask : Does increased action constitute “ that phenomenon which immediately precedes the state which we call disease, and without which previous phenomenon, the disease (inflammation,) is not known to exist ? ”

If the exciting cause induce contraction of the minute vessels, the only mode of increased action of which they are capable, the fluids they contain will be forced out, and they, (the minute vessels,) will in consequence be reduced to a state of comparative depletion ; a condition utterly incompatible with the existence of inflammation, which requires as the very essence—the *sine qua non* of the disease, an absolute distention, or over-distention of the capillaries. Believing, however, that the very best method of getting rid of a false theory, is to establish one that is true, and particularly as we wish to avoid even the semblance of aggression, we shall push this point no farther ; but turn our attention to the opposite theory.

It is admitted by all that there is more blood in a part when inflamed than in a state of health : and it is also affirmed by micro-

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\* The above is Parry's definition of the proximate cause,—the best extant.

scopical observers that that fluid moves through the vessels of the part affected with greater rapidity than when the circulation is normal : but these facts, if indeed the latter be a fact, have no relation whatever to the proximate cause which relates solely to the manner in which the increased quantity of blood gets into the vessels. An agent, acting mechanically, chemically, or physically upon any part of the system, which makes an impression exterior to the vessels stronger than that made by the fluids within, will in obedience to the law that the stronger effaces the weaker impression, induce them to forego their resistance ; and yielding, allow themselves to be distended, or over-distended until they resist painfully. We have then distention of vessels, the primary symptom ; redness, the second ; and pain, from resistance, the third ; the trio, which constitutes the formal and technical existence of the disease—the assemblage by which it is recognised. Now what but diminished action could have preceded this “state which we call disease ?” Had the action of the capillaries been increased, no such result could have followed, even by possibility : neither could it have occurred if those vessels had not relaxed, yielded and suffered themselves to be distended or over-distended. We infer then that the proximate cause of inflammation is a suspension of the normal resistance ; a relaxation ; a yielding ; a diminished action of the capillaries of the part that admits, upon hydraulic principles, of the inflowing of fluids by which they (the capillaries,) are over-distended. This want of action, this non-resistance, continues until the distention has proceeded so far as to excite actual resistance in the capillaries, and then, and not till then, can we affirm the existence of the disease. The action of the vessels is then increased. This increased action, the final end and natural consequence of which is, not only to prevent the additional influx of fluids, but to force them out of the inflamed part, constitutes the true *vis medicatrix naturæ* ; for it causes, or attempts to cause, and if successful does cause, the reflux of fluids into the general circulation, which is equivalent to an evacuation by art. In both instances the vessels are depleted. This result, (the depletion of the vessels,) we deem, as before stated, the only legitimate termination of inflammation—whether brought about by the efforts of nature, by remedies, or the conjoined operation of both.

It has been asserted, that there is not only more blood in an inflamed part, but that it moves through it more rapidly than in health, and that there is, therefore an increased action. Neither of these facts concerns the proximate cause ; the stage of the disease

having gone by for that. Relating wholly to the proximate effect, they confirm our doctrine.

The exciting causes of inflammation, as we have shown in a former paper, diminish resistance in the capillaries—venous as well as arterial;—consequently, as much, and even more blood will be admitted into them, and transmitted through the inflamed part than in health. But this condition of things cannot last long; because the fluids, changed in their chemical and physical properties, will be forced in every direction upon vessels which have not been subjected to the exciting causes, and therefore do not participate in the morbid actions of the part. Those vessels, thus acted on mechanically, by fluids chemically and physically altered, promptly set up a resistance to the *vis medicatrix naturæ*, the exertion of which is to force the fluids out of the vessels of the inflamed part; a result which may be, and most generally is, prevented by the aforementioned resistance of the surrounding vessels. A pause now ensues; the fluids stagnate in the centre, around which, and towards the circumference, the vessels being distended to a degree which constitutes congestion, relieve themselves by the effusion of fibrine, with which the blood abounds during the phlogistic state. This fibrine, the effusion of which has depleted the vessels, becomes organized, and furnishes a barrier to the further extension of the mischief. Beyond said barrier, serum is poured out in such quantities as to occasion the œdema that often accompanies inflammation, and evinces diminished intensity wherever it exists.\* For the foregoing reasons we have come to the conclusion that decreased action is the proximate cause of inflammation.

#### INDICATIONS AND METHOD OF CURE.

It is undoubtedly the duty of the practitioner to endeavor at all times to prevent disease; but as this paper has respect to cure rather than prevention, we shall omit to notice the indications which relate solely to the latter, except to remark, that those which pertain to prevention look directly to the proximate cause;—the reason is obvious, for without “that phenomenon, the disease is not known to

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\* This œdema is very apt to take place as above described, in inflammations of the larynx, and particularly about the glottis, and constitutes the principal cause of danger in many of those cases, especially if conjoined with spasm of the muscles belonging or appertaining to those parts. We shall consider this effusion of serum in connection with another part of our subject.

exist ;"—and indirectly to the remote and exciting causes, they being essential to the production of "that phenomenon," the *causa proxima*.

As medical men, we must not, however, lose sight of the fact, that the remote and exciting causes, when present, tend to keep up the disease, and therefore have in such cases a strict relevancy to the cure. The first indication, then, is to remove them. But as they are often absent, and the disease apt to go on after their removal, we do not regard that matter as coming fully within the scope of this paper, and consequently omit its farther consideration.

Having endeavored to explain the manner in which this over-distended state of the vessels, the proximate effect is produced, we shall now consider—1. How it is kept up. 2. The method and means by which it is removed.

1. How is this over-distended state of the vessels—the disease, (the immediate effect of the proximate cause) kept up ?

The action of the heart, (whether increased or not,) with the elasticity of the larger arteries, constitutes the *vis a tergo*—the power behind—which continually and unceasingly forces the blood along into the capillary vessels of the inflamed part ; and so maintains and keeps up their over-distended condition. But why does not the blood pass through and out of them as fast as it enters ? Having briefly referred to this point in connection with the *vis medicatrix naturæ*, we shall proceed to consider it more particularly in relation to one of the indications of cure.

It has been shown, that if a hollow viscus having an outlet, or capillary having a pore, be suddenly distended, or from any cause whatever made to act inordinately, the sphincter or pore, resisting as suddenly and violently, would hold fast and prevent the transmission and egress of the distending fluid ; thus in consequence of the *vis a tergo*, constituted as described, on the one hand, and the resistance of the pores on the other, the over-distended state of the vessels, which comprises the very essence of the disease, is kept up in all its intensity. The conflict is then between the heart, the capillary vessel, and the pore ; or, more particularly, between the first and the last. And the practitioner who has most skill in adapting remedies to the adjustment of these opposing agents and actions, will oftenest succeed in curing inflammation.

To comprehend this matter *in extenso*, it should be remembered, that the capillaries and pores on the inner and outer surfaces, as the skin and mucous membranes, and internal organs, as the liver and kidneys, are in a state of distention and resistance, hence the dry

skin, parched tongue, constipated bowels, paucity of urine and bile, which go to make up the *tout ensemble* of the symptomatic fever of inflammation; or the phlogistic diathesis. Now, the mere softening of the skin, or the appearance of moisture on the tongue, its tip or edges for example, indicates the yielding of the pores in those parts, and foretokens a general relaxation. They are, indeed, the harbingers of the diarrhœa, copious sweats, and flow of urine, secretion of bile, &c., which constitute the crisis, so much reckoned on by the older physicians. Although the quiescence, or abatement of the heart's action precedes and contributes to the relaxation, effusion, &c., it should not be forgotten, that the perspiration when general, in its turn, like blood-letting, relieves the heart, and is therefore the precursor of permanent amendment in inflammation as well as in most fevers. The same may be said of the other evacuations.

In the normal condition, and under healthy action, the pore or sphincter, first in the order of events, relaxes; but in inflammation, for wise purposes, this order of events is reversed. If the pores yield while the *vis a tergo* continues, the effusion of fluids from the several kinds of vessels involved, will be so copious as to destroy either the structure or function of the part or exhaust the patient;—therefore, they (the pores) must not yield. Shall the vessels forego their resistance? if so, they will be more and more distended by the action of the heart, until they lose their vitality, and gangrene will be the result; therefore, they must not relax.

As our leading indication of cure flows from this doctrine, as a natural, regular, and legitimate deduction, and the success of our treatment depends mainly on the principles it involves, we hope to be excused for attempting to exhibit it free from obscurity, or risk of misapprehension.

Referring then to the urinary bladder, as furnishing the most familiar and favorable example for illustration, we say we can recollect no instance of retention of urine in which the sphincter yielded and permitted that fluid to pass incontinently before that viscus had become fatigued (paralyzed as the common phrase is,) and ceased from, or remitted in some good degree its inordinate expulsatory efforts, thus affording a most happy elucidation of a law, certainly very general, perhaps universal: that the sphincter or pore does not yield prior to the abatement of the *vis a tergo*, or in other words, until the equilibrium between the action of the viscus and its sphincter, or the capillary and its pore is restored. The reasons for this are indeed quite obvious. Soon as this equilibrium is established, the sphincter

relaxes and allows the urine, as in the example adduced, to escape through the urethra as fast as it enters the bladder by the ureters.\* So when the capillaries are over-distended and act inordinately the

\* What are the practical deductions from this doctrine in relation to the medical treatment of retention of urine, one of the most distressing "ills flesh is heir to?"—also in respect to other affections of the bladder and urethra? They are, 1. Induce the patient to refrain as much as possible from all straining, or efforts of an expulso-  
 tory character. 2. Bleed to fainting (if warranted by the circumstances of the case,) which suspends for a time the action of the bladder, and the resistance of the sphincter, and both may and often do participate in the spontaneous relaxation which takes place in the capillaries over the whole system when the patient recovers from the syncope induced by the bleeding. 3. Give a full dose of opium which lessens the sensibility of the bladder and its sphincter, and likewise the action of both. In retention there is not a more efficient remedy than opium, in a liberal dose, from two to four or five grains, according to the severity of the symptoms or urgency of the case. The warm or hot bath is often an excellent adjuvant, and in connection with the other measures prepares the way for the surgical treatment—the introduction of the catheter, with which it will be well to commence, in most cases, unless contra-  
 indicated. In the early part of the disorder simple exposure of the naked body to the air, or dashing cold water on it by the pailful, (causing capillary contraction) disturbs the morbid relation which obtains between the bladder and its sphincter and causes the urine to flow. A similar course, so far as voluntary effort is concerned, may be pursued, with propriety, in the treatment of most diseases of the bladder and urethra, attended with difficult micturition, which are always made worse by the straining of the patient, from which he should be instructed to abstain as much as practicable and trust solely to the powers of nature, spontaneously and uncontrollably exerted. Moreover it should be recollected that derangement of function generally precedes organic disease; and particularly in these organs, that form of malady is often brought on by the injudicious exertions of the individual, which more and more disturb the function and of course increase the affection; which in turn disorders more and more the function and excites to more strenuous exertions. It is, therefore, the duty of the practitioner, especially in the incipency, and indeed through the whole course of these complaints, to caution and advise the patient on these points, and he will have the satisfaction of finding, that if no cure is effected, the progress of the disease will be retarded. This doctrine has a no less strict and practical bearing on the functional disorders of other hollow viscera, having sphinctered outlets, as the uterus, rectum and stomach. In obstetric practice it is of no ordinary importance. The uterine contractions have for their object, 1. To open the mouth of the womb. 2. Expel its contents. Now the os tincæ holds the same relation to the uterus as sphincters do to other organs with outlets; the law or principle of action is the same in all, which is, if the organs act gently or normally the sphincters relax; but if suddenly or inordinately, they hold fast, or contract the more energetically; and this is just as it should be, for great inconvenience and misery must follow, if the sphincters yielded on every occasion, when the organs with which they are connected contracted suddenly or violently. If then the uterus should act irregularly or

pores do not relax before the action of the heart has somewhat abated; and this is as it should be, for if they relaxed, prior to the abatement of the action of the heart, there would be nothing to op-

too forcibly, the *ostium* would, as in duty bound, like other sphincters, not relax or suffer itself to be dilated; but resist the more strongly in proportion to the inordinate action of the womb, and of course retard or prevent the expulsion of its contents.

The abnormal action of that organ arises from two causes, viz.: the voluntary efforts of the woman, and too great determination of blood to its substance. 1. The cause which most frequently disturbs the equilibrium between the action of the womb and its sphincter is the voluntary bearing down of the patient herself. Parturition is mainly a function of organic life, and the power by which it is performed is of course one of its attributes. Now then, the voluntary power which belongs to animal life, should be neither invoked, nor allowed to be exerted when it can be prevented, which it can be to a considerable extent if the patient be docile and is instructed and urged to refrain from its exercise, a thing she will endeavor to do of her own accord, after having realized the benefit during a few pains. The primary object of uterine contraction is to open the *ostium uteri* preparatory to the extrusion of the contents, and so long as this process of dilatation is going on, or until it is completed, all voluntary efforts are prohibited by the nature of the case; they are not called for, do no good but much evil, for they aggravate suffering and retard labor by forcing the contents of the womb violently against the sphincter, which causes it the more pertinaciously to resist.

When the *ostium* is fully dilated, it may be supposed that moulding and adapting the presenting part, and its transit through the passage would be hastened if the pains were increased by the voluntary bearing down efforts of the mother; but it must not be forgotten that the process still belongs to organic life; and that therefore, all such efforts should be withheld, and Dame Nature, who is never thwarted with impunity, be allowed to have her own way, and the female attendants, ever ready to interfere on such occasions, with their advice, at least, made to stand by in silence, and let her dameship have fair play. When the presenting portion comes to press on and distend the external parts, the process assumes a mixed character; the parts to be dilated belong to animal life, but nature, true to her principles and purposes, has ordained that the power, by which the distention of these parts as well as the expulsion of the child is to be effected, remain still an attribute of organic life; therefore the volitions of the patient must be excluded as worse than useless.\* The policy and practice inculcated should be pursued to the end of labor. By so doing the suffering is greatly mitigated and the danger of laceration dwindles to a point. Having practised according to this system during the principal part of his professional life, the writer has known a great number of women pass through even first labors with comparatively little suffering. Some have declared, in one hour after delivery, that they felt well, as if nothing had happened, and indeed, the whole getting up has been of a piece equally favorable and satisfactory. The principal difficulty has often been

\* If encouraged or allowed to make much voluntary exertion, she may become too much debilitated or exhausted to complete the labor, hence the demand for instruments, for which there will be very little need if the course recommended be followed.

pose or prevent the effusion of fluids in such quantities as would, in every instance, derange or destroy the function or structure of the part or organ in which the disease was located. When the *vis a*

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to keep them quiet, and exercise the degree of caution deemed necessary to secure them from the inconveniences and perils which so naturally cluster around the puerperal woman. This will be readily comprehended when it is considered that voluntary efforts alone produce fatigue; hence the fatigue, debility and exhaustion, from the effects of labor, are to be chiefly traced to the strenuous exertions put forth by the patient. Women, in the savage state, practising upon this principle, bring forth with little suffering or inconvenience, and not unfrequently has the writer witnessed the same thing in civilized life, even in primiparous cases. The women, I know in one and doubt not in both instances, refrained from voluntary exertion, and so far as child-bearing was concerned were on a level. The chloroform, by merely suspending volition, performs all that is really required of it as an anæsthetic agent in obstetric practice. After all, it is the fiat of the Almighty that women "in sorrow shall bring forth children," but the malediction neither demands that she should suffer beyond what is necessary, as a punishment for having disobediently followed the bent of her own inclination, nor prohibits attempts to mitigate her sorrows.

2. Too great determination of blood to the organ, and abnormal quantity of that fluid in the capillaries of the uterus, stimulates them to contract, and they do contract violently in order to force it out. Now, what all the vessels of an organ do, that will the organ itself as a whole do; hence, the violent action of the womb under such circumstances, and the simultaneous or consecutive action of its sphincter, which resists dilatation, and of course prevents the expulsion of the uterine contents. This state of things may be suspected when there are strong pains with little effect, other than distressing the patient,—when the pulse is full, frequent, or perhaps hard, with hot skin, thirst and restlessness; but it may be ascertained to a certainty by the *touch*. The os will then be found dry, tender, and unyielding,—often but little affected by the pains,—sometimes contracting instead of dilating during their existence, notwithstanding their violence.

When the equilibrium between the action of the uterus and its sphincter is disturbed from this cause, bleeding until the pulse falters, or fainting approaches, equalizes the circulation, removes the disturbing cause, restores the balance of power and action between the viscus and its outlet, and the labor progresses with all due expedition. Tartar emetic in nauseating doses, will sometimes do the same. We not very unfrequently find pregnant women near the time of confinement, complaining of what are termed "false pains," which are no other than the contractions of portions of the uterus whose capillaries contain an undue proportion of blood, that stimulates them to contract, while those in other portions having only their proper quantity, remain quiescent. These are distinguished from the true pains by producing no effect upon the os. They disturb and harass the patient, and sometimes the young and inexperienced accoucheur, who does not exactly know what to make of them, or what to do to remove them; but he may derive comfort from the assurance that a small bleeding or two, with some castor-oil, will equalize the circulation, and consequently remove the difficulty.

*tergo* continues, and the pores persist in their resistance, the capillaries may resist until they lose their vitality, and we shall have what is technically called gangrene; but this never happens, as the result of inflammation, without the concurrence of the two contingencies just mentioned. If the pores yield there may be disorganization, but not mortification; if the *vis a tergo* cease prematurely, the vessels may not be able to relieve themselves or even maintain their vitality, and gangrene be the result; but it cannot be said in the strict and legitimate sense of the terms that gangrene has been produced as the consequence of inflammation. To repeat, the conflict is between the *vis a tergo*, the capillaries, and their pores. In health, the last yield for the relief of the former; and the same order of function obtains in this disease if moderate; in which case the relaxation of the pores unloads the vessels and cures the inflammation.

2. The method and means by which this over-distention of the vessels is removed.

This branch of the inquiry embraces the indications of cure proper; to the consideration of which we now proceed.

From the foregoing principles and doctrines it may be inferred that relaxation of the sphincter or pore is the ultimate object to be aimed at by the practitioner; but to effect that with safety, the *vis a tergo* must be diminished; until that is done the sphincter or pore should not relax, and probably never would relax if the disease were intense: hence the natural, regular and legitimate deduction, that to lessen the *vis a tergo* so as to restore the equilibrium between the vessels and the pores, is the first indication of cure. Now the *vis a tergo* cannot in every case, or indeed in a majority of cases be so far diminished as to secure this result without endangering the life of the patient; therefore a second indication is required, which is: to lessen the effect of the fluids impinging against the inner surfaces of the capillaries, which excites them to inordinate action and disturbs the harmony of function between the vessels and the pores.

If the foregoing were the only indications, it is obvious that even they could not invariably, or under all circumstances be fulfilled with safety; therefore, a third indication is demanded; which is: to diminish or take off the resistance of the pores. A fourth indication relates rather to the removal of consequences, than to the cure of the disease. For example: to remove from the part affected whatever has been effused or secreted by which the vessels have been emptied, and the inflammation cured; but which if

allowed to remain might impair, interrupt or destroy the function or structure of the organ or part.

FIRST INDICATION OF CURE—THE DIMINUTION OF THE VIS A TERGO.

In health the *vis a tergo* is kept up by the normal action of the heart, aided by the elasticity of the arteries; and in inflammation it is rendered more intense by the increased action of that organ, induced by the augmented quantity of arterial blood admitted into its substance. If this increased action of the heart be produced and kept up by the augmented quantity and perhaps also, in some degree, by the vitiated quality of the blood thrown into its substance by the coronary arteries, reason and common sense alike dictate the propriety and necessity of lessening the quantity of that fluid.

The method, then, of fulfilling this indication is, 1. By the antiphlogistic regimen, which comprises perfect quietude of body and mind; pure air, abstinence, diet and proper temperature. When the phlogistic diathesis prevails, digestion is disturbed; chyme, badly formed; assimilation, imperfect: the fluids, changed and unhealthy, make a strange and novel impression on the inside of vessels and stimulate them to irregular and morbid actions: the withholding of food lessens the circulating mass; diminishes the power by which it is moved, and abates the morbid sensibility which feels its impulses; results, which extend to organic as well as animal life. For these reasons, nature and theory both suggest diet and regimen; and experience confirms the suggestion; the quantity and quality of the ingesta are therefore matters worthy of consideration.

2. By blood-letting; general and topical.

GENERAL BLOOD-LETTING.

If the quantity of blood be considerably and rapidly diminished by venesection, the vessels of all parts, diseased as well as others, feel the effect; that is, they contract *pari passu* with the abstraction of their contents: If syncope, which consists in an universal and extreme contraction of the capillaries, be induced, the fluids in the inflamed as in other parts will be forced out of them (the capillaries) into the larger vessels.\*

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\* The practitioner who has ever bled a patient, laboring under conjunctivitis, to fainting, must have observed that all the symptoms and phenomena of inflammation

Now this violent and universal contraction of the capillaries must be followed by a spontaneous relaxation, or the patient will certainly and quickly die.\* This relaxation is usually manifested first in parts abounding with capillaries, as the face, upper part of the chest, and finally over the surface generally; hence we find the former portions and frequently the whole skin covered with perspiration before the capillaries of the brain and heart, acting in sympathy with those of the integuments, have relaxed. A wonderful provision of nature this! For exactly in proportion as the capillaries of the surface are filled, those of the internal organs will be relieved of a portion of their contents; so that this relaxation and consequent filling of the cutaneous capillaries really and truly answers for the time being, and permanently, if kept up as it should be, all the purposes of an abstraction of blood.

In order to make the most of this spontaneous relaxation, it should be borne in mind that it may be increased and prolonged much beyond what is natural by the administration of a full dose of opium, immediately on the recovery of the patient from the fainting caused by the bleeding. By depriving the vessels of a portion of their organic sensibility, the narcotic influence of the drug co-operating

have disappeared, and that owing to the shrinking of the capillaries the diseased eye had indeed become as bloodless and white as the other.

\* There is one case in which this contraction of the minute vessels is not followed by the spontaneous relaxation of which we have spoken, and that is when the principal artery in a limb has been tied, or the circulation through it wholly and suddenly obstructed; contraction of the minute vessels necessarily ensues; a sense of coldness is experienced and the temperature actually falls several degrees; the surface assumes the asnerine appearance without the redness, and the hairs stand off more at right angles. In a few days the limb seems to resume its natural warmth and is generally supposed to become preternaturally warm; but this is apparent—not real; it is the effect of the additional clothing in which the limb is usually invested; when that is removed and the two limbs exposed to the air, the temperature of the one still falls considerably below that of the other.†

The great practical deduction to be drawn from the fact that this species of contraction is not followed by spontaneous relaxation, is the propriety and necessity of additional clothing to prevent too great contraction which might be productive of speedy gangrene; and of withholding warm applications which might induce a relaxation and over-distention of vessels that could not be sustained and mortification would no less certainly follow.

† The verity of these observations I have recently had an opportunity of testing in a case in which the external iliac artery was skilfully and successfully tied by my friend and associate Dr. William H. Van Buren, of this city.

with the law of the system, carries this relaxation much beyond what is natural, and moreover holds the vessels in that state of dilatation some ten, twelve or sixteen hours, or until a considerable time after the specific effect of the medicine may be supposed to have ceased, during which the patient is easy, and comparatively free from disease. By this method or mode of practice an inflammation of a formidable character may be terminated at a blow; a dose of salts or castor oil completing the cure. If the symptoms return, the same process should be repeated; modified according to circumstances. Or if again; an occurrence which we have seldom witnessed, they must be met in a similar manner; or by such other means, as the judgment of the practitioner shall dictate, as the warm bath, &c. When the intensity of the disease has been considerably lessened and the powers of the system enfeebled, the pleasant impression made by the physical influence of heat and moisture will induce a degree of relaxation that will remove the pain which still afflicts the patient, and so prove a substitute for the lancet.

This relaxation is not confined to the vessels of the inflamed part; but extends to all the capillaries and especially to those on the surface; they being more particularly subjected to the aforementioned instrumentalities. Into them the blood will flow, and so long as it there remains, both the heart and the site of the disease are freed from its influence; a result equivalent to an evacuation. On this principle and under such circumstances, I am in the habit of resorting to the warm bath, as to venesection, so often as the pain returns, and therefore keep the tub nearly filled in the sick room that by the addition of a small quantity of boiling water the temperature can be raised to the requisite degree and the patient immersed; and on the removal of the pain, returned to bed; after which anodynes, or sudorifics, as the James' powder, with or without opium may be administered in order to hold what had been achieved by the bath. The foregoing practice may be pursued in croup, laryngitis, and other inflammatory affections complicated with spasm or irritability, by the skilful practitioner.

The number of inflammations of a purely unmixed character, or free from all complication with one or the other circumstances just alluded to, are very few—fewer indeed, according to my observations, than is generally supposed. In a large proportion of cases in the great cities, all the symptoms are aggravated and the disease kept up, to the detriment and often danger of the patient, by a vitiated condition of the circulating fluids—a condition which requires that de-

pletion and narcotics should be blended—the one for emptying the vessels\*—the other for lessening their morbid sensibility, which prevents their feeling and responding to the impressions made, not only by the momentum of the circulating mass, but by its irritating qualities.†

Determination of blood to the head does not preclude this practice of giving opium according to the principles laid down, unless the substance of the encephalon, the nervous centre itself, is seriously involved; in which case it may be questionable, owing to the fact that the narcotic acts directly on the nervous system.‡

In many cases analogous to those in which the warm bath is so useful, a ligature applied to the thighs near the body, sufficiently tight to interrupt the return of the blood through the veins without at all interfering with its passage in the arteries, may be made to answer the purposes of an evacuant. When these ligatures can be no longer borne on account of the uneasiness and discomfort they occasion, they may be removed and applied to the arms near the axillæ. This use of the ligature will be recognized as being in perfect accordance with the principles laid down.

The safety and success of this practice, it will be seen, depend

\* From observation, the writer is convinced that the lancet might be used with advantage much more frequently than it is, in the large towns.

† The practice of giving opium after bleeding, which has been just detailed, so far as the writer is concerned, sprang from a remark of Darwin, that a bleeding immediately preceding an opiate, increased its efficacy. The gentleman with whom he commenced the study of medicine being a great admirer of that author, adopted the suggestion, and often bled patients to whom he was about to administer an opiate. Having frequently witnessed the salutary results of the practice, he also adopted it; and from repeated trials discovered that the principle and practice were susceptible of a much more extensive application than was at first apprehended—that in fact opium might be given, not only with safety, but with the happiest effect in cases of inflammation, if bleeding were premised, in which, according to the theories then in vogue, it would have been utterly inadmissible. Encouraged by success, and emboldened by a tolerably-enlarged experience, he came at length to use it in the manner now recommended, and is unable to call to mind a single instance in which he has had reason to regret having done so.

‡ During the last season, I was called to a lady whose case bore the strongest marks of determination of blood to the head I had ever witnessed without positive symptoms of grave cerebral disturbance. I was never in more doubt, whether or not to adopt the practice which has been recommended; but confidence in the principle prevailed. The lady was liberally bled; took a grain and a half or two grains of opium and six grains of the pulvis antimonialis, and was, literally speaking, well the next day; a profuse perspiration having followed.

on the great and certain relaxation that takes place in the capillaries over the system, and which is, as long as it lasts, equivalent to evacuation. In order to secure that result, the narcotic must be given in a full dose. It is not required that we should always bleed to fainting. A small bleeding of from eight to twelve ounces will often answer the purpose, and that too in many cases in which the opiate, but for the bleeding, would have aggravated every symptom. Again, the vehement contraction of the capillaries throughout the system, during fainting and the subsequent relaxation, will have so adjusted the balance of circulation, even without the narcotic, that the vessels of the diseased part will be able to resist, for a time at least, the *vis a tergo*, and prevent the intromission of fluids in an abnormal quantity: hence the remission of symptoms which so generally succeed a decided blood-letting. But the capillaries of the heart, like those in other parts, may, and often do, sooner or later, relax and re-admit more blood, which causes its action to be renewed with so much energy that the vessels of the inflamed part, unable to resist the impelling force of the blood, yield to its impulse and are again over-distended; a condition indicated by the recurrence of pain and suffering, which calls for a repetition of the bleeding. Several bleedings may be, in fact, required before the equilibrium between the *vis a tergo*, the capillary and the pore is restored. When that has been accomplished a free and general perspiration usually breaks out.

When the case is left to nature, this result is brought about in another way. The heart, the capillaries, and the pores experience fatigue, and must have rest; to obtain which they forego action and resistance, and the balance of circulation is restored. The morbid phenomena disappear, and nature is said to have performed the cure. But why is she not always competent to do this? Because the heart with that "charity which begins at home," first supplies itself with arterial blood through its coronary arteries; the consequence of which is, that its own action is increased, by which more blood is thrown into its capillaries, and its increased action is thus kept up so long as the mass of blood remains undiminished, or until the capillaries (the antagonists of the heart), in every part of the body, have relaxed and become filled with blood; a state which so far as it goes, and so long as it lasts, is equivalent to an evacuation, because considerable time must elapse before the blood, thus distributed, can find its way back to the heart. That organ, thus acting, and re-acting upon itself, will continue its augmented efforts until either the capillaries of the diseased part have lost their tone or vitality; or,

until exhausted by its own over-action, it has become too feeble to sustain the vital functions; hence, any sudden and considerable subsidency of the pulse in a case of inflammation, indicates either commencing gangrene, or approaching dissolution. For these reasons we conclude that nature is not competent to cure all cases of inflammation.

Venesection, as it is skilfully or unskilfully employed, is potent for good or for evil. It is therefore, important that definite rules should be laid down for determining—1. When it should be resorted to. 2. When the proper quantity of blood has been drawn. 3. When the operation should be repeated.

1. When is venesection to be employed?

In order to answer and settle this question, we must constantly keep in mind, that the specific object of blood-letting is to lessen the *vis a tergo* by diminishing the quantity of blood in active circulation. The fulness, hardness, and sometimes the frequency of the pulse, in connection with other circumstances of the case, indicate the propriety and necessity of bleeding. Hardness and softness of bodies, are the qualities which enable them to resist impressions; and in feeling the pulse, they are measured by the degree of muscular contraction, which forces the finger against the artery, and the resistance opposed by the vessel to that contractile effort. The pulse should be examined in both wrists, for it is, now and then, occasionally soft in one and hard in the other; a condition which calls equally for the lancet, as if hardness prevailed in both. If there be perplexity and doubt, it may be well to feel the pulse in other arteries, as the carotids, &c. The pulse, however, is not always to be relied on; for there are cases in which neither its hardness, tenseness, nor fulness is very manifest, and yet bleeding may be proper, and even necessary. In such cases the heart must be appealed to and examined. If that organ beat strongly, it will be right and proper to bleed,\* as suggested by Laennec,—a suggestion of great practical importance as furnishing a criterion for the safe and proper use of the lancet under very perplexing circumstances.

The condition of the diseased part may likewise assist us in deciding upon the propriety of venesection; for the exalted sensibility,

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\* If the action of the heart be strong, we may bleed, although the pulse is feeble, and vice versa,—if the action of the heart be feeble and the pulse strong, we may not bleed at all, or with great circumspection. I have been long in the habit of observing this rule, and have never been misled by it.

and over-distended, stretched, and resisting state of the vessels of the part are declared and measured with tolerable accuracy by the feelings of the patient, pain on pressure, &c.\* If the pain be severe, abstraction of blood is required for relief; but there are cases in which neither the pulse, nor the state of the part, nor the feelings of the patient, actually demand the lancet; yet, a small bleeding will nevertheless prepare the system for other remedies; especially the antimonial powder and opium; a dose of the latter, preceded by a moderate bleeding, will frequently give the most effectual relief, which but for that would have aggravated all the symptoms.

## 2. When has the proper quantity of blood been drawn?

By discriminating accurately between a preternatural fulness and distention of the heart and arteries as hollow organs, and an over-distended state of the capillaries, as in inflammation, involving many vessels, we may often pre-estimate how much blood should be drawn. When the accumulation is mainly in the cavities of the former, (the heart and arteries,) the abstraction of blood is direct, and likewise its effect; consequently, a small quantity will answer the purpose; but when the latter (the capillaries) are implicated to any considerable extent, the quantity must be larger, in order to cause them, like the heart and arteries, to feel that the mass of their contents

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\* Notwithstanding the tenderness of an inflamed part, the pain caused by pressure, although an almost invariable concomitant, is by no means peculiar to inflammation; but is often connected with hysteria, or other nervous affections. In these, the exaggerated sensibility or tenderness, is confined to the surface, and is owing to excessive innervation of parts supplied by the peripheral extremities of the sensific nerves. Under such circumstances, pressure, whether local or general, even if continued for some time, and considerably increased so as to affect deep-seated, or internal parts, soon ceases to be felt or complained of, if the attention of the patient is diverted by conversation, or in any other way. Pressure, to be diagnostic in inflammation, should be made suddenly on a point, which forces the blood out of the vessels where it is applied, into those adjacent, and produces an aggravation of the pain; why? because the vessels in an inflamed part are all in an over-distended, stretched, and resisting condition, which is increased by the displaced fluid, being forced into those immediately contiguous, by which they are still more distended and stretched, and the pain consequently aggravated. When pressure, instead of being suddenly and locally made, is applied gradually, generally, and equably, the pain will often be not only not aggravated, but actually alleviated;—for the pressure has, to a certain extent, lessened the quantity of fluid contained in the vessels. Upon this circumstance the utility of compression, as a remedy, depends. But if the vessels be not emptied by the pressure, additional inconvenience will be experienced from it as well as from the distending influence of their contents.

has been lessened. As this mode of judging may not be deemed sufficiently accurate for scientific and practical purposes, the sensations of the patient, state of the pulse, action of the heart, &c., should be taken into the account as the principal and most reliable means for determining not only whether it is right and proper to bleed at all, but also when the suitable quantity of blood has been taken.

The rule then, is to let the blood flow until the pain abates or ceases; till the pulse flags or falters or syncope is induced, which last affords plenary evidence that enough has been lost. To that point, in severe cases, should the bleeding be carried—generally. In such as are milder, the flow of blood may be stopped when the changes in the pulse and feeling aforementioned are manifested. In cases of a mixed character, although some blood may and should be drawn, yet so much only as will relieve the fulness, or over-distention of the capillaries need be abstracted. In such, and indeed in all cases in which it is practicable the patient should be bled in the erect or sitting posture, because he will generally become faint just when the proper quantity of blood has been lost, which in mixed cases will be small compared with what it would be if the disease had been purely inflammatory.

In every case and under all circumstances, in which bleeding at all is proper, it is desirable and even indispensable that a certain quantity of blood, proportioned to the severity of the disease, should be drawn before fainting is produced; and as some persons faint very easily, from fear or the loss of a little blood, it will be best to place the patient in a recumbent posture and allow him to remain in it until the quantity deemed requisite has been abstracted, when he may assume the sitting or erect posture and the blood still allowed to flow until syncope ensues. By so doing we may economize in the loss of blood and gain all the advantages, and avoid the disadvantages which may accrue from a bleeding. The question may be here asked with propriety, why is fainting to be considered one of the criteria by which to determine how far the loss of blood should be carried? In fainting there is, as has been remarked, a universal contraction or shrinking of the capillaries, as well those in the inflamed as in other parts. Nature seems, so to speak, to take advantage of the enfeebled state or temporary quiescence of the heart to force the contents of the capillary vessels back into the larger vessels, and likewise through the pores, which in health constitute a portion of the power antagonistic to that organ, but now, in consequence of its diminished action, forego their resistance; hence the sweating which so frequently

accompanies or follows syncope, and which is often cold, resembling that occasioned by the contraction of the capillaries in the moribund. If the fainting be incomplete, a warm sweat may be the immediate consequence. For an obvious reason we should be in no hurry to remove the syncope; as a general rule the longer it continues and the more slowly it goes off, the better.

### 3. When should the bleeding be repeated.

The return of the pain, after having been relieved by venesection, is a sign of the renewal of the *vis a tergo*, and also of the resistance of the capillaries and the pores; all of which, as in the first instance, call for the lancet—if slight, perhaps for topical bleeding only. When a repetition is proper, the quantity to be drawn is to be regulated by the rules already laid down under the second head.

As to a repetition of the bleeding, and also sometimes its first use, it is proper to remark that nice discrimination is occasionally required, in order to determine whether the local symptoms, especially when an internal organ is concerned, depend on an over-distended or an over-contracted state of the capillaries; the former produced by an augmented, the latter, by a diminished quantity, or vitiated quality of the fluids. The extremes here, as in many other instances, seem to meet—the sensations are similar—to all ordinary perception or discrimination, the same. To make the proper distinction may be difficult, but of vital importance; because, if in the first instance we stimulate, the patient may be destroyed; if, in the last, we deplete, the consequence may be equally unfortunate. If the pain and local symptoms arise from an exalted sensibility or an exhausted or depraved state of the fluids, narcotics, which diminish sensibility, and consequently prevent the vessels feeling the impressions made by the irritating qualities of the fluids, are the remedies which afford greatest, most relief. It is on this account, in part, that opiates are, as has been shown, so useful in the treatment of inflammation. The pulse, temperament of the patient, condition of the system and part affected,\* are the sources whence our conclusions are to be drawn.

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\* See Note on page 31.

## CATHARTICS.

Having finished with the consideration of general bleeding as a measure for the fulfilment of the first indication—the diminution of the *vis a tergo*—but experience having proved that that most efficient remedy is not admissible in all cases, and that in those in which it is proper it cannot be carried to the necessary extent with entire safety to the patient, we are, therefore, constrained to look for other means, the most prominent of which are cathartics. Like bloodletting they act mainly as evacuants; not merely emptying the alimentary canal, but depleting the vessels. As counter irritants they are sometimes beneficial. In all these respects, their *modus operandi*\* will be readily comprehended, as coinciding with the doctrines advanced by a recurrence to them and to the axioms on which they are founded.

As a cathartic, calomel is one of the best; if not the very best. Besides its virtues as an evacuant it possesses the quality of correcting the secretions, and is therefore eligible in most cases, and pre-eminently so in those in which the secretions are much disordered or vitiated. If the patient complains of a bitter taste, nausea, sense of weight or load at the stomach, and exhibits a tongue covered with a dark or yellow fur, an emetico-cathartic, or simple emetic, followed by cathartic medicines, may be administered with the happiest effect. In many instances in which the symptoms enumerated are present, an emetic which equalizes the circulation will be of great service. In our experience, that of Des-sault, a little modified, is the best. His emetic was one grain of tart. antim. in a pint of water taken at once. This dose may have been sufficient for a Frenchman; but unless the Gallic medicine is stronger than ours it will not, in a majority of cases, emeticize an American, on which account we direct six grains to be dissolved in as many table-spoonfuls of water, and one in a coffee-cupful of gruel or cold water, given every fifteen or twenty minutes until the puking commences, which should be encouraged by taking large draughts of some cold liquid immediately after each time vomiting. The patient must be instructed to imitate spontaneous vomiting as much as possible, and abstain from all efforts to assist in the operation—in other words, to let the medicine do its own work.†

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\* See remarks on Counter Irritation, page 42.

† In further illustration of the doctrine promulgated in these papers, we remark that the stomach belongs to organic life, and having a sphinctered outlet is governed by the same laws which govern all other organs of that class, as the bladder, etc. When that viscus acts gently the sphincter at the pylorus relaxes, and suffers the contents

Emetics should be administered in the fore part of the evening, especially when we wish to break up the routine of a fever, or inflammation. The reason of this will readily occur to all. As an emetico-cathartic, the following compound has much to recommend it :

R. S. m. hyd.	grs. xij.
Pulv. antimonialis,	grs. vj.
Tart. antim.	gr. j.
Mix. To be taken at once in a little syrup.	

The quantity of tart. antim., may be increased, diminished, or entirely omitted, as the case may require. This dose, if not sufficiently active as a cathartic, may be followed by salts and senna, or by salts only. When there is bile in the stomach the antimonial powder in doses of from six to ten grains is a sure and gentle emetic. The pulvis antimonialis, having lost favor with the profession, on account of alleged inefficiency, is rejected by some and sparingly used by others. Having employed it a great deal during a large portion of his professional life, the writer holds it in high estimation in febrile and inflammatory affections attended with considerable excitement. If preceded by bloodletting and cathartics proportioned to the severity of the case, it will seldom disappoint the expectation of the practitioner. The failure to produce the desired effect has probably arisen from one or more of the following causes—the bad quality of the medicine, too small doses, or omission to bleed and cathartize previous to its administration. Instead of being small, the dose should be as large and as often repeated as the stomach will bear. When saline cathartics are indicated, or from any cause preferred, the following is recommended, which occasionally acts as an emetico-cathartic :

R. Sulph. magnes.	℥ij.
Sulph. sod.	℥i.
Tart. antim.	grs. iv.

Mix and dissolve in eight ounces of water. Dose, half or two-thirds of a

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to pass, and no vomiting ensues ; but if it act irregularly or violently, as when an emetic has been taken, the sphincter does not relax ; but holds fast, and prevents the passage of the contents in that direction ; and they are forced upward through the cardia, which constitutes vomiting ; thus far the operation pertains to organic life and the patient suffers little distress from it ; but why should he abstain from voluntary efforts ? Because the muscles of volition, the organs of locomotion, experience fatigue which is peculiar to them ; therefore if they are not exerted the vomiting will produce little or no exhaustion, or sense of weakness ; indeed but slight disturbance in the system, a result oftentimes very desirable when patients requiring an emetic are much debilitated.

wine-glassful every hour, hour and a half, or two hours, until it begins to operate.

In affections of the brain, requiring active catharsis, the following will act promptly and efficiently :

R. Aloes, calomel and gamboge, aa	ʒij.
Tart. antim.,	grs. vj.
Croton oil,	gtt. ij.

Mix—make into a mass, and divide into 20 pills—one to be taken every hour or two, until full catharsis is produced.

We have extensively used tart. antim. in the treatment of inflammation—particularly pneumonia in its first stage. Although of no great value in pleurisy, its use is not prohibited when inflammation in the lung has extended to the pleura. The writer's method of giving it, in that disease, is to begin with a quarter of a grain once in twenty or thirty minutes, until two doses have been taken, when half a grain should constitute the third dose, which is to be repeated in half an hour; at the end of the next half hour a grain should be administered. If given at such short intervals, the stomach and intestines soon lose their susceptibility to its impression, and seem not to be at all affected, even by enormous doses.\* As soon as the disease seems to be pretty decidedly

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\* Connected with the repetition of emetic medicines, particularly tart. antim., is a fact of considerable practical importance: If a full, or rather over-dose of that article, or of ipecacuanha, (and perhaps of most other emetic drugs,) is given, and several or many repetitions are required, the succeeding doses may be regularly lessened, say one-fourth each time, with no diminution of effect. The writer has known a patient in the habit of taking ipecac. as an emetic, to be at last as effectually vomited by one-sixth of a grain as by twenty at first. In the treatment of all such diseases as require frequent vomiting, we may avail ourselves of this principle. On the other hand, if we commence the use of these articles in minute doses, and repeat them at short intervals, the system will soon lose its susceptibility to their peculiar stimulus, and the dose may be increased *ad infinitum*, almost, without any appreciable effect. If repeated every twenty or thirty minutes, the dose may be doubled every other time, until it becomes very large; and yet no emesis or catharsis follows. Augmented thus, as by the rule of geometrical progression, the action of the heart is much lowered both in force and frequency, and the inflammatory affection disappears, as suggested in the text—why or wherefore we cannot exactly tell. In the administration of narcotics, particularly opium, the same principle holds. In some cases, the long-continued use of remedies of this class is necessary. As in the former example, the system loses its susceptibility for their particular impression, and the dose must be increased to a frightful extent; nor is this all—there is great danger that the habit, dreadful as it is, of opium taking, or rather opium eating, will be formed, and then the fatal drug cannot

checked, or subdued, which it will be in two or three days, the medicine should be discontinued altogether or partially, as the case may require, and mercury given, which will prove much more beneficial in the second stage than antimony. If the disease has passed the first stage the antimony should be withheld and the mercury given.

## SECOND AND THIRD INDICATIONS OF CURE.

The second indication is: to diminish the impression made upon the capillaries and pores by the impulse of the fluids impinging against their inner surfaces and the effect of that impression. The third indication is, to lessen or take off the resistance of the pores.

As these indications are so intimately connected, and the remedies employed for their fulfilment so analogous, we shall consider them together.

It will be readily comprehended how lessening the action of the heart weakens the impression of the fluids upon the capillaries and the pores, and so contributes, as far as it goes, to fulfil the second indication; and also how that which weakens the forementioned impression will likewise lessen or take off the resistance of the pores, which constitutes the third indication; without the fulfilment of which, it is believed, that no inflammation of much standing will be cured.

That abatement of the momentum by the abstraction of blood is not of itself capable of preventing the morbid impulse, or wholly obviating its effects, is clear from the fact that the vessels contracting *pari passu*, with the abstraction of their contents, are in perpetual contact with them, consequently the impulse must be made and felt in proportion to its force and the sensibility of the vessels; hence the necessity of the second indication which is to diminish the impression and its effect. It is

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be dispensed with. It is of great importance to avoid these consequences, which may be done by making the first dose considerably larger than is demanded by the exigencies of the case, and each succeeding one less and less: suppose a case which will probably require the repetition of an anodyne two or three times daily, and that forty drops of laudanum is quite sufficient to produce the desired effect—fifty-five or sixty instead of forty should be administered at first, and each subsequent dose lessened one drop, perhaps two. In this way the dose will be continually getting smaller and smaller, while the effect remains the same, and the destructive habit is not formed. If the dose (40 drops) be given in the usual manner, after a short time the system, having lost its susceptibility to that dose, will not respond, and the quantity must be increased in order to secure the effect, and ten drops are added; in a few days another addition must be made, and another, and another; and so on, until half an ounce, instead of 40 drops, is demanded; and what is worse, even though the disease is removed, the patient is cursed with a habit more dreadful than death itself.

well to remember that the fulfilment of this indication contributes to that of the third; for if we lessen the force and effect of the impulse, the sphincter or pore will, as we have endeavored to show, relax; and furthermore, it may be proper to remark in this place, that although we have made three distinct indications of cure, they are so closely, naturally and philosophically connected that they almost necessarily resolve themselves into one, viz., the abatement of the force and effect of the impulse—that being done the pores will relax and the vessels be emptied or depleted and the cure accomplished. The medicines adapted to the fulfilment of these indications are of two kinds—such as act on the system generally, and such as act locally on the part affected. The former, by equalizing the circulation, diminish the impulse; and some of them, into the composition of which narcotics enter, lessen the effect of that impulse by obtunding the vascular sensibility. Belonging to this class are sudorifics—medicines of great importance, and by no means to be dispensed with; the best of which is the antimonial powder, either alone or combined with opium, by which its efficacy is in many instances increased—especially if the rules laid down have been observed. The Dover's powder, by itself, in as large doses as the stomach will bear, or combined with the pulvis antimonialis, will be found of great utility. Instead of the Dover's powder the writer has often substituted one composed of opium, camphor and ipecac., each one part, and nitrate of potash two parts; a preparation which certainly adds considerably to the efficiency of the antimonial powder. The dose may be regulated by the quantity of opium required in each individual case.

The old-fashioned compound, the spiritus Mindereri, is a valuable remedy; but which often fails from not being rightly administered. It should be given warm, in ounce doses, every hour or two, until the perspiration appears. The patient ought to be kept in bed with more than ordinary covering and made to drink freely of warm liquids. If there be much irritation, laudanum, or the elixir paregoric in appropriate doses may be added from time to time. Instead of being given alone, it may alternate with the sudorifics before mentioned, in which case it must be less frequently repeated.

The colchicum autumnale is often employed with advantage, especially after bloodletting. Combined with the digitalis, it is a tolerable substitute for the lancet in subjects not plethoric or athletic. By reducing the frequency and subduing the force of the heart's action, and promoting secretion and excretion, they coöperate with other evacuants in fulfilling the first indication; and by their narcotic influence are more capable of contributing to the fulfilment of the others. Calomel as an alterant,

either by itself or combined with the antimonial powder—two grains of the former with four or six of the latter may alternate every fourth or sixth hour with the colchicum. In severe cases as in croup, laryngitis, etc., calomel must be given more frequently and in larger doses, with a view to its specific effect, or to the changes it is supposed to produce in the blood.\* When colchicum has produced its specific effect,† even in a moderate degree its use may be suspended and the sudorifics continued. Digitalis, acting as a sedative, is a medicine of considerable power. Reducing the frequency and subduing the force of the heart's action, like venesection, it diminishes the *vis a tergo* and the impression; and in consequence is adapted to the fulfilment of the first and second indications, but must not in urgent cases supersede the use of the lancet. How much effect the foxglove has on the capillaries and pores, independent of its influence on the heart, is difficult to determine. Its narcotic and particularly its sedative powers, are too considerable to be overlooked. The forms of inflammation in which the writer has employed and found it most useful, are pleuritis and meningitis. In all chronic inflammations, like colchicum, it will be found most beneficial when the urine contains an undue proportion of lithic acid or albumen;‡ without one or the other of these contingencies neither of those medicines will be of much service. If the urine be merely turbid, or incline to a bloody appearance, as it sometimes does in chronic inflammation and in dropsy, very satisfactory results may be expected to follow the use of the digitalis.

### TOPICAL REMEDIES.

The second class of remedies for the fulfilment of these indications are those which act locally; the object of which is to diminish the action of the vessels and lessen or take off the resistance of the pores in the diseased part. Their use presupposes the employment of such general remedies as may have been required.

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\* The writer, judging from his own observation and experience, feels warranted in saying that very few cases, if treated on the principles inculcated in these papers will require or even justify the use of calomel to the extent deemed necessary by many practitioners.

† By the specific effect of colchicum, purging is not meant, that being unessential to its peculiar influence as a therapeutic agent; but may be looked on rather as a sign of its having taken effect. In fact its purgative operation seems not to differ materially from that of other cathartics.

‡ In all cases of pneumonia, and in most cerebral affections, the state and condition of the kidneys, and of their secretion, should be inquired into with great care.

## LOCAL BLEEDING,

By cupping and scarifying, or by leeching, stands at the head of this class. Whatever causes the vessels to act less violently, or gently, will induce the pores to relax. By directly depleting the inflamed vessels topical bleeding lessens the cause of their distension or over-distension, by which their efforts to expel the contained fluids, or resist their distending force, will be rendered less intense as may be inferred from the mitigation of symptoms which follows this mode of depletion, and is commonly more marked if preceded by the general remedies which have been recommended. Moreover, local abstraction of blood frequently reduces the action of the heart; lowers the sensibility of the vessels; diminishes the impulse and its effect, and contributes in all these ways to restore the equilibrium of action, without which the pores will not relax and allow that effusion of lymph and serum which empties the vessels and completes the cure. In producing relaxation of the capillaries and pores, this method of bleeding acts upon another principle besides that of depleting the vessels.

By assuaging pain and mitigating suffering, it is equivalent to a pleasing impression and therefore causes relaxation; pleasant impressions induce relaxation, disagreeable impressions excite contraction and resistance, therefore in the treatment of inflammation, our applications should be made in accordance with one or the other of these principles. On account of the pain or irritation occasioned by cupping and scarifying leeching is preferable in superficial inflammations. When deeper seated, or when internal organs are involved, the former is to be preferred. In whichever way the blood is drawn, the quantity must be regulated by the judgment of the practitioner; the constitution, age and circumstances of the patient, and the effect of the depletion being taken into the account.

## EXTERNAL APPLICATIONS.

The solution of the acetate of lead has been employed time out of mind, as an external local remedy, and in many instances with probable advantage. Although much used as it has seemed rather from imitation and habit, than a settled conviction of its real utility, it may be as good as almost any thing else with which we are acquainted. With laudanum or opium superadded, it certainly has a soothing and consequently beneficial effect; but whether it is any more useful than water with the aforesaid additions is somewhat questionable. The efficacy of saturnine applications has been attributed to a sedative power which they were supposed to possess. If they really had any such virtue, they would be en-

titled to great consideration. Could they lessen sensibility or vascular action, they would diminish the impulse of the fluids and its effect on the vessels; but it is to be regretted that the testimony of the profession is not very decided in their favor.

The solution of the acetate of ammonia, is an excellent application and may be used like the foregoing, with or without opium or laudanum.

Evaporating liquids, or such as produce cold, as ice-water or pounded ice, may be applied. The latter, on account of the absorption of the caloric of solution, (140° Fah.) is potent for good or for evil; we are therefore bound to consider in this place, the principle upon which cold, as an antiphlogistic remedy, acts. Causing the contraction of vessels subjected to its influence, it may be resorted to before the action of the heart has been roused, and while the local contraction which it induces, is able to resist effectually the *vis a tergo*;\* but when the vessels have become over-distended, and the *vis a tergo* so strong, that the contraction produced by the cold is insufficient to force the fluids out of the capillaries of the part, the pain will be aggravated by cold applications. After bloodletting, catharsis, etc., by which the heart's power and action are lowered, they may be very proper and useful, but if the powers of life have been too much exhausted, such applications may produce a degree of contraction incompatible with the vitality of the vessels and gangrene ensue. The principles laid down in a former part of this paper in relation to pleasant or unpleasant impressions come in here most happily. When applications of low temperature are grateful to the feelings of the patient, they are proper; if disagreeable, they are improper and should give place to such as are warm.†

\* Hence the utility of cold water applied immediately after a sprain or bruise, or the infliction of a wound by accident or by design, as in surgical operations. For many years past, the writer has been in the constant habit of using cold water after his operations, as soon as the plasters have had time to become well set, and to continue it for several days, say five or six.

† In making applications to an inflamed eye, even this rule should be followed with some caution. In general they had better be tepid than warm; when the latter are employed, it should be only for a few minutes at a time. The objection to the long-continued application of poultices or fomentations to the eye, grows out of the anatomical structure of that organ. In that form of disease called "morbid sensibility of the retina," the writer has found that cold water to the eyes always keeps up or aggravates the difficulty; so much so, that he does not allow patients affected with it, to wash the eye at all, nor in bad cases, the upper part of the face, much less to let any get within the lids. In such cases, patients are in the habit of applying the cold water to the eyes freely, and not unfrequently open them when submerged in it, and they

These principles furnish an infallible rule respecting the temperature of such appliances and settle the mooted question, whether lotions, poultices, etc., to an inflamed part, should be cold or warm.

#### OF COUNTER IRRITATION.

In the deeper-seated inflammations, and especially those which involve internal organs, great benefit may be derived from stimulating applications; but for want of a correct knowledge of the principle upon which their utility depends, it is to be feared that more hurt than good is not unfrequently done by them. The principle is—the stronger external, effaces the weaker internal impression. In the treatment of perhaps every case of deep-seated or internal inflammation, there is a “blistering point”—in other words, a time when irritating or stimulating applications should be made; a condition which cannot be recognized with certainty without a correct understanding of the principle on which rests the utility and safety of those applications. The object of blisters, rubefacients, etc., is mainly to relieve pain or uneasy feeling. The pain of inflammation, as we have seen, is caused by an over-distended or resisting state of the capillaries. If those vessels can be induced to relax, the pain and suffering will cease. Now, if the disagreeable impression made by the blister, which is external, be stronger than that made within by the fluids, the vessels not feeling the internal impression, relax, and the pain is relieved—entirely, if the relaxation be complete. If the impression of the blister be not, however, stronger than that made by the fluids within, the symptoms will be aggravated; there may, indeed, be no vesication, because the internal is stronger than the external impression. The aggravation of the symptoms is explainable in the following manner: the impression of the blister has been sufficiently powerful to induce the vessels to relax or forego their resistance; but the *vis a tergo* has not been suitably diminished, of course the relaxed vessels will be again crowded, and as much over-distended and act as violently as before; for which reason the pores will not relax, consequently the pain of resistance will be renewed. Before the blistering or stimulating application can be made with prospect of relief, or even without the hazard or risk of injury, the following questions must be answered in each individual case: Will the

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will tell you that the eyes invariably feel the better for it, which is undoubtedly true but this effect is only temporary, the disease is no less certainly kept up and aggravated by the practice. In some cases of chronic ophthalmia, the same effect is produced by the use of water. In ophthalmia, cold applications should be applied very extensively, to the whole head or most of it. Our principles furnish the explanation.

irritation of the blister induce the vessels to relax? And if so, has the action of the heart, or the *vis a tergo*, been so much subdued that it will not force the fluids into the diseased vessels, and cause them to be again over-distended, and therefore prompted again to resist painfully? The stimulating, or "blistering point," is then attained only when the vessels will relax in consequence of the application, and the *vis a tergo* so much abated as not to cause them to be again over-distended. Prior to this, a blister will certainly produce the ill consequences to which we have alluded. In the treatment of affections of the joints, the writer has most frequently noticed this error in practice. He has witnessed many instances in which practitioners have applied a few leeches to a joint, and followed them with a large blister; the result was what might have been anticipated by one familiar with the principle—the joint became swollen, hot, and painful; requiring a long succession of fomentations, poultices, and general treatment, for the removal of the mischief done by the ill-timed blister. He has likewise often seen the same bad practice enacted in pneumonia and pleurisy—particularly the latter. The patient had been bled, purged, blistered, and, as a matter of course, made worse by the last remedy, which ought to have been deferred until the action of the heart had been subdued to the degree required. In all such cases, the blister, when too soon applied, may indeed cause the pores internally to relax; hence the effusion which sometimes (in truth not very unfrequently) follows the application of a large blister to the chest in pleurisy, to the abdomen in peritonitis, or to a joint in synovitis, before the inflammation has been sufficiently subdued by bleeding, etc.\* The vessels, it is true, have been emptied and the inflammation cured by the effusion; but another disease, as dropsy of the chest, abdomen or joint, is produced—quite an undesirable result. Effusion is likewise very apt to follow the application of a blister in phrenitis, and many a child has lost its life in consequence. After effusion, blistering, by promoting absorption, may be exceedingly proper and useful.

In one other respect this class of remedies deserves consideration. Inflammation in the incipient or forming stage is often removed at once by the fortunate application of a local stimulus; we say fortunate, because the principle on which it acts under such circumstances has not been very clearly pointed out or very well understood. The vessels directly

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\* I have recently seen a case of pleurisy in which a large quantity of serum was effused into the cavity of the thorax immediately on the drawing of an extensive blister on the side directly over the seat of the pain.

involved are crowded and over-distended with blood, while those immediately surrounding retain their natural condition, or rather assume the attitude of resistance, which prevents the over-distended vessels from forcing their contents onward, and in consequence returning to their normal state. If now a strong stimulant is applied which makes a more vigorous impression externally than is made internally by the fluids contained in the aforesaid vessels—they will relax and give the fluids in the first a more easy passage through them and a more ready admission into the last, by which the ordinary circulation in the part is restored. In this way inflammation of the conjunctiva is cured at once by stimulating collyria; of the tonsils and throat by stimulating gargles; and gonorrhea by stimulating injections. But how often do we see matters made worse by blunders perpetrated by those who do not fully comprehend the principle upon which success is founded. The general state of the patient, that of the circulation and of the heart's action, and the duration of the difficulty, should be investigated before resorting to such measures.

#### LOTIONS, ETC.

Formerly it was the custom to apply medicated lotions, but, with few exceptions, they are no better than simple water, except so far as they amuse the patient or friends. Under such circumstances they will probably do the more good and for this reason it may be well to use them. Infusions of hops, cicuta, stramonium or mallows, as fomentations, are comforting and useful. Besides their sedative and narcotic qualities they make a pleasant impression which causes the capillaries and pores to relax—thus easing pain by taking off resistance.

Poultices of bread and milk, or medicated with linseed or narcotics, are also beneficial. In a great majority of cases, however, they may be dispensed with and cloths moistened with water, or some of the infusions just mentioned, laid on the part and covered with oiled silk, used in their stead. A sponge, imbued with those liquids and applied in the same manner, will be found convenient, especially if it be desirable to make gentle pressure, the sponge being applied and bound with a bandage and moistened afterwards.

#### POSITION.

In conclusion—a word respecting position. This is a matter which is certainly too much neglected. Gravity, by retarding the flow of blood into an inflamed part, lessens the *vis a tergo*, the impulse and its effect;

moreover, by facilitating the egress of fluids, it diminishes their distending force which keeps the capillaries on the stretch and prompts them to make painful resistance. Position is thus made to answer all the purposes of an evacuant without the debilitating effects of depletion. Let it be remembered that emptying the vessels of the inflamed part is all that is required for the cure of inflammation, consequently position, when fully consulted, greatly abates the demand and sometimes supersedes the necessity for active depletion, therefore the inflamed part should be elevated as much as is consistent with the comfort of the patient. So thoroughly convinced is the writer of the importance of position that he treats no case of inflammation, surgical or medical, without reference to it.

P. S.—In another point of view, posture is important, and in some respects corroborative of the views presented and entertained in these papers.

Early in his professional career the writer was called to amputate the limb of a patient so much debilitated that none of the gentlemen in consultation would advise to the operation, from the conviction that the patient would die in its performance—without it, all agreed that death was inevitable. After much reflection and mature deliberation he arrived at the conclusion, that, such was the weakness of the heart, if the limb was raised for a short time, nearly all the blood it contained would gravitate into the body, which would then actually contain more of the vital fluid for the support of functions essential to life than before; and furthermore that the effect might be enhanced, if needed, by the elevation of other members. Not that “rashness triumphed over caution,” but confidence in the principle prevailed, and prompted to the operation. The limb was elevated to a perpendicular, and sustained in that posture until bloodless and nearly pulseless, when the tourniquet was tightened and the operation commenced and finished. The other limbs were also somewhat raised and kept elevated for several days. The recovery was slow, but fortunate for both patient and surgeon, whose first amputation it was. Since then he has not unfrequently, in similar cases, resorted to the same expedient and always with satisfaction.

In extreme cases, all the limbs may be raised even to a right angle with the body, and sustained in that position for a longer or a shorter time, or until they are emptied of their blood, which may be retained in the trunk for present and temporary use, by compressing the arteries. So far as the writer knows, this practice originated with him, at the time above specified. Every obstetrician will readily appreciate its value and

importance in dangerous floodings—conjoined with opium in large doses, which produces relaxation in the cerebral capillaries, it may be instrumental in saving many valuable lives by contributing to supply with blood the nervous centres whose functions may thus be kept up until the system has time to rally.

## INFLAMMATION—ITS CONSEQUENCES.

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IN the preceding pages the writer has explained the *modus operandi* of the exciting causes in the production of inflammation, and shown that the proximate cause consisted in a decreased action of the capillaries pertaining to the inflamed part, and that the proximate effect was by inevitable consequence a distended, or over-distended condition of those vessels, and that that over-distended condition actually constituted and comprised the disease itself. From these premises it was inferred that depletion of the capillaries, by whatever agency accomplished, comprised the cure. Upon that broad inference, the first, second and third indications of cure were based ; but as depletion of the aforesaid vessels is not unfrequently effected or accompanied by a simultaneous effusion of their contents into the tissues immediately surrounding them, or other contingencies and consequences which derange structure or function, another and distinct indication, not having relation to the cure of the disease, was deemed necessary, which we now proceed to consider.

### FOURTH INDICATION

Is to obviate the consequences of the disease ; or more particularly, to remove from the part affected whatever has been effused or secreted, by which the vessels have been relieved and the inflammation cured. In other words, the *sequelæ* of the disease.

The reason of this indication is quite obvious ; if the matters so extravasated were allowed to remain, they would in most instances, as suggested, either impair, interrupt, or destroy the function or structure of the organ or part. If the organ was essential to life, the most serious results might be apprehended. This view of the subject brings us to the consideration of the various terminations, technically so called, of inflammation. The doctrine inculcated in these papers is, that inflammation has but one legitimate termination, i. e., by depletion ; but as systematic writers teach, and the profession in general reckon on several, as resolution, suppuration, ulceration, and gangrene or mortification, we feel bound to consider them, with the exception of gangrene, separately, and in so doing shall endeavor to trace out the principles on which they depend, and the laws by which they are governed, and also the rules by which the treatment proper to each should be regulated.

## RESOLUTION.

When from the nature of the cause, degree, duration or treatment of the disease, the effusion of serum, or lymph, or both,\* takes place early, or in a quantity so small as to be speedily absorbed, yet sufficient to empty the vessels, the inflammation is said to terminate in resolution, the result always to be aimed at. The signs which evince that resolution is taking place, or is about to do so, are to be found in the modifications of the phenomena essential to the existence of the disease;† viz. increased heat, redness, pain and swelling. When examining with a view to the probable occurrence of resolution, we should pay particular attention to the changes manifested in the edges and purlieus of the disease; for instance, the decrease of the redness and swelling is first perceptible in or about the margin of the inflamed part, before the slightest change in either of these symptoms can be perceived in other portions. The peripheral parts being in juxtaposition with those that are in a state of health, it is reasonable to suppose, that the vessels of the former will first resume the functions of health, and that the fluids which give rise to the abnormal color and swelling, will be absorbed and removed by vessels in the neighborhood, whose functions are only disturbed, but not actually interrupted, as they are in other parts where the morbid causes have acted with more energy.

From the abatement of the pain, and subsiding of the swelling, it might be inferred that resolution was certainly going to take place; but sometimes the tumefaction does really increase, and that considerably, when resolution is about to follow; hence, if ignorant of the anomaly and unacquainted with its cause, we might be led to give a wrong prognosis. To avoid such a mistake, it is necessary to discriminate between the increase of tumefaction by effusion, and that which arises from mere distention of vessels, which is done by noticing the difference of feel; that from effusion is much softer than that from distention of vessels. The changes of sensation, which accompany these different conditions, should also be taken into the account as constituting an important ground of distinction. When the increase of swelling is from effusion, the pain, heat and sense of vascular distention abate, be-

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\* The nature of the effusion, though varied by the cause, intensity and duration of the disease, is also modified by the structure of the part. If the disease is slight, or of short duration, there may be an effusion of serum only, causing œdema or local dropsy; if of a higher grade, or of no longer continuance, coagulable lymph, as well as serum, will be effused, and the part for a time remain indurated, and its function impaired.

† This principle will be likewise observed when considering the other terminations of inflammations.

cause the vessels are depleted ; when from over-distention, these sensations are all aggravated, and furthermore, the redness is also increased. In fact, the abatement of the aforementioned symptoms affords the most certain criterion by which to judge of the probability that resolution will be effected, especially in the early stages of the disease.

Resolution, in the strictest sense, is accomplished by early restoring the equilibrium between the capillaries and the pores,\* in order to prevent copious effusion. The means for accomplishing this having been considered in former papers, the rule of practice for the fulfilment of the fourth indication in connection with resolution, is to promote the absorption of the effused matter, which is accomplished by friction, blistering, compression, made by bandages, compressed sponges, and such other means as the ingenuity of the practitioner may suggest. The compressed sponge bound firmly on the part, and then kept quite wet for twelve or twenty-four hours often works wonders. The oftener it is exchanged for a piece that is freshly pressed the better. The general remedies are mercury, emetics and cathartics, which however are seldom required or employed.

#### ADHESION.

Adhesion is considered a termination of inflammation—erroneously, as we conceive and have endeavored to show.

It happens when coagulable lymph in small quantity only is effused. Now, the effusion has emptied the vessels and cured the inflammation ; the adhesion, being subsequent, is effected by a process entirely new.—This must be so ; few accidents more certainly prevent adhesion than inflammation. Every surgeon, desirous of securing union by the first intention, anxiously deprecates its approach, which he knows is so apt to frustrate his purpose.† Effusion of fibrine is all that is required in the first instance ; and increased action, just enough to produce it, is necessary—all beyond that is to be avoided. This process of adhesion presents a series of interesting phenomena, and is to surgery what steam

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\* It should be kept in mind, that it is not at all times the absolute over-distention which disturbs the equilibrium, but often the suddenness and violence with which the contained fluid is forced against the sphincter, if the organ be large, or pore if a capillary is concerned, which causes them to resist. Even when vessels are over-distended, if we make warm, soothing applications, which diminish or take off their forcible action, the pores will, as has been suggested, relax, and effusion follow, in which case resolution may ensue. In the early stage only is this to be expected with much confidence.

† “Adhesive inflammation,” a most unfortunate phrase, was introduced by John Hunter, and from his time to the present has misled the profession.

power is to mechanics—the origin of invaluable improvements; the cause of astonishing results. It was first noticed by quacks, who of course kept the discovery a secret, and availed themselves of its advantages in practice, for the purpose of filling their purses. Openly they dressed and doctored the instrument which inflicted the wound,\* the lips of which cheatingly they brought together, and covered them with some magic powder or balsam, which kept them in contact. Charms and all sorts of fooleries were resorted to for amusing and diverting the multitude; but the healing of the wound in a few days by adhesion, was the valuable result.

The just treatment of all wounds, whether the result of accident or of surgical operation, requires that the practitioner should have a precise and perfect knowledge of the laws by which the process of adhesion is governed, and the rules by which the practice should be regulated. The laws are:

1. The quantity of fibrine effused must be so small as not to prevent the vessels, new or old, which shoot into it, from inosculating one with another.† If they so inosculate, adhesion is perfected by the organization of the fibrine, and the morbid process terminates;—but if the quantity effused is so great as to prevent the inosculatation of those vessels, they will immediately commence secreting pus, and the granulative process is soon instituted. The rule of practice is, therefore, to keep down morbid action, and so prevent the too copious effusion of fibrine and serum, which would prevent inosculatation.

This law, with some slight modification, probably obtains in most internal inflammations which involve the serous membranes.

2. The surfaces should not be pressed so firmly or closely together as to prevent the effusion of fibrine—if so, they will act upon each other, as extraneous bodies, and excite inflammation, by which adhesion

\* The practice above alluded to, was not wholly abandoned, even some years after the writer commenced business; for he distinctly recollects one case to which he was called, and found that the doctor in attendance had actually applied his dressings to the axe, the implement which had inflicted the wound; and another, in which both tines of a pitchfork had been wrapped up, because, forsooth, it could not be ascertained to a certainty which had inflicted the injury.

† This law, and the rule of practice, relates to wounds and abscesses; for, if the sides of a wound or an abscess be not brought so closely in contact that the vessels which shoot from the opposing surfaces into the coagulable lymph (which glues them together) cannot inosculate or unite immediately with one another, they will secrete pus, and form granulations, by which the wound or abscess will be filled, and ultimately healed. This species of union, in technical language, is termed “Union by the second intention.”

will be prevented. The rule of practice deducible from this law is : To lay and keep the surfaces of a wound or abscess in easy contact by the gentlest means.

3. That nothing be interposed which would prevent the inosculation of vessels. The rule of practice is, to remove all extraneous bodies—blood, and even fibrine, if the quantity be such as to prevent inosculation. This implies that all hæmorrhage shall have been effectually stopped, as well as the blood removed, before the parts are brought into contact. Without this precaution, the blood subsequently effused would cause a violation of this very law.\* Although this may be considered as a modification of the first law, yet we have been induced to lay it down as a distinct law, in special reference to the treatment of wounds, and more particularly in relation to an accident which not very unfrequently occurs in the practice of the young surgeon; to wit, *the turning in of the edges of the skin*. When this is allowed, union by the first intention cannot take place; the interposed cuticle acts as an extraneous body, and prevents adhesion as effectually as a piece of wood or any other foreign substance;—indeed, the healing process does not commence until the cuticle is detached and removed, when the surfaces made raw by the removal will adhere or granulate. This oversight generally retards the healing of a wound three or four weeks; a delay much to be regretted, without adverting to the pain and suffering so unnecessarily inflicted on the unfortunate patient. A good constitution, although not essential, renders success in procuring adhesion more certain.

#### USES OF ADHESION.

This process of adhesion, as connected with disease, is of invaluable utility in the economy of the system. In the serous membranes within the abdomen or thorax, if the inflammation be mild, serum only is effused—if one grade higher, coagulable lymph will be poured out at the point where the disease is most intense, which will glue the membranes together, and thus stop the further progress of the malady, while the effusion around it has emptied the vessels and cured the disease. The tendency in these membranes to adhere, depends upon the fact that only a moderate degree of inflammation stops the natural secretion on their free surface, and renders it dry. Now this dry sur-

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\* After the dressing of a wound, serum, and indeed fibrine, may be effused into its cavity in such quantity (especially if retained) as to prevent inosculation. This retention is caused by dressing too closely, in the first instance; and, in the second, by the drying and caking of the dressings, which prevents escape of further effusions. Hence the propriety of the cold water dressing, which not only restrains hæmorrhage, but by preventing the drying and caking, facilitates the egress of the serum, &c. •

face, in either membrane, coming in contact with an opposing portion, acts as an irritant—as an extraneous body—exciting inflammation in it, which in like manner suspends in that spot the ordinary effusion of serum. These opposite surfaces, thus conditioned, act and react upon each other, until coagulable lymph is effused, which glues them together, and serves as a bond of union, which, becoming vascularized, is rendered permanent by the organization, more or less perfect, which ensues. But for this adhesion, the disease would probably have extended over the whole membrane, and in most instances destroyed the patient,—by its intensity or extent interrupting the functions of important organs; or by the effusion of serum in such quantities as to produce the same consequences in another way. In cases of this description, the rule of practice deduced from the pathology connected with them is, to moderate or keep the inflammation within certain bounds; for if the quantity of fibrine poured out be so great as to prevent the inosculation of vessels, as heretofore represented, pus will be secreted in such quantity as to break up and dissolve the adhesions which surround it on every side, and fill the thorax or other cavity with sero-purulent matter. In intussusception, the intussuscepted portion of intestine inflames, mortifies, sloughs off, and is finally discharged per anum, and the patient sometimes recovers—the adhesion having secured the continuity of the intestinal canal. In strangulated hernia, also, when the gut mortifies, adhesion, fixing the part at the groin, prevents the escape of the fæces into the cavity of the abdomen, and at the same time establishes an artificial anus. When suppuration occurs in the cellular membrane, adhesion prevents the migration of the matter from one part to another.

#### DISADVANTAGES OF ADHESION.

Instances not unfrequently occur in which adhesion interrupts the function of organs, so as to destroy life, or render it exceedingly uncomfortable.

#### SUPPURATION.

Suppuration has been usually considered one of the terminations of inflammation; but the intermediate links between inflammation and suppuration seem to have been overlooked, viz.: the effusion of coagulable lymph, and the formation of new vessels, which, with a single excep-

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\* That exception, (if, indeed, it be an exception,) is to be found in the inflammation of the mucous membranes. It is said, and perhaps generally believed, that the vessels which open on the surface of these membranes, and which, in a state of health secrete mucus, pour out pus when inflamed. When inflammation is not sufficiently intense to prevent the secretion of mucus, the quantity will be increased, in consequence of the increased determination of blood to the mucous follicles, on the principle that the function of every organ, whether of sensa-

tion,\* always precede the secretion of pus. These new vessels, which secrete the pus, with the parenchyma which connects them together, compose the granulations, which, being piled one upon another, fill the

tion, secretion or motion, is increased by an augmented flow of blood—within certain limits—to that organ. When inflamed, the capillaries which circulate the serum, fibrine, or the colorless constituents of the blood, are distended, but empty themselves by pouring out fibrine, into which the new vessels shoot, which new vessels, or old ones invested with lymph, as the case may be, as in other instances, secrete pus, which, mingling with the mucus, has given rise to the opinion that the same vessels which secrete the mucus secrete pus also when inflamed. This increased secretion of mucus is undoubtedly salutary :—1. By depleting the vessels, which tends to cure the inflammation. 2. By keeping the inflamed surfaces asunder ;—thus obviating adhesion and closure of the canals.\* 3. By causing the removal of the lymph, or preventing its becoming so fully organized as to enable it to maintain its ground. The motion of these parts also greatly contributes to prevent adhesion.

We remarked that if the effusion of coagulable lymph was so large in quantity as to prevent the new, or primitive vessels, which shoot into it from insculating with one another, they immediately commence secreting pus, which is deemed to be “altered blood ;” and that the alteration of the blood, so as to constitute it pus, is the function of the new vessels, but they answer a secondary purpose, viz. the organization of the lymph ;—their peculiar, appropriate and primary function is, we repeat, the secretion of pus. All that is required is an investment of fibrine about new vessels, or the old ones elongated, in order to enable them to perform this function. When the effusion takes place in passages communicating with the external air, as in the bowels, urethra, or air passages, it will be readily understood why the quantity of fibrine is too small to give rise to granulations, adhesions, or serious obstructions. These consequences, it is believed, never happen unless fibrine has been effused into the cellular substance immediately surrounding the mucous membrane, and into its texture, by which its peculiar structure has become changed, and its inner surfaces, thus altered, are brought into contact with each other, and adhering, finally become organized, and the canal permanently closed. If ulceration has ensued, the contraction of the granulations, by drawing the parts together, contributes to the same result. If this union does not take place, a stricture may ensue : this, however, depends much upon the size or calibre of the tube, and its destitution of motion, as in the lachrymal ducts, the fallopian tubes and urethra.

In bronchitis and pneumonia, we often hail the secretion of pus as a favorable symptom. “Like the bow in the heavens,” it indicates “the subsidency of the storm,” because it continues the process of emptying the vessels, begun by the effusion of lymph.

In the formation of pus on the mucous surfaces, without the effusion of lymph, in such quantities as to give rise to adhesion, granulation, or change of structure, we behold the foresight and wisdom of the Creator. If adhesions formed, death

\* When the inflammation is intense, there will be no secretion of mucus, which we have explained on the principle that over-distension, and consequently violent action, disturb the equilibrium between the excretory vessel and its pore.

cavity, and constitute what is technically called "Union, or healing, by the second intention." Although we sometimes speak of "laudable pus," the formation of matter is never the product of healthy action.—It may be modified by the part affected—the state of the constitution—the cause and character of the disease.

#### SYMPTOMS AND SIGNS OF SUPPURATION.

Besides seriously involving the reputation of the surgeon, it is, in a practical point of view, often an affair of great importance to the patient to determine concerning the existence of pus, which is most certainly and scientifically done by carefully studying the modifications and changes that take place in the phenomena of inflammation, which immediately precede, accompany and follow the formation of matter. We are, therefore, in every case in which that result is anticipated, to keep a steady eye on those changes. In the first of these papers, the phenomena in question were carefully considered, not merely in strict regard to the nature of the disease, but indirectly with reference to this point.

#### 1. PAIN.

In what way is the pain, or sensations, in the part modified, so as to indicate the formation or existence of matter?

In acute inflammation, the first or earliest symptom indicative of the formation of matter, or that it is about to form, is the accession of sharp, lancinating, shooting, darting pains, as if needles were streaming off in various directions in the inflamed part.\* The change of action, the perception of which gives rise to these sensations, is the yielding or relaxation of the pores, and consequent effusion of serum

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would be the inevitable consequence; if granulations, they would alter the structure, and render the part incapable of performing its appropriate function; or they (the granulations) might continue to accumulate and obstruct the passages, and in that way interfere with, disturb, or wholly interrupt the performance of the function. Our conclusion is, that the mucous membranes do not afford an exception as hinted in the text.

\* These sensations are peculiar to the serous membranes: the cellular membrane, partaking of their nature, also experiences them. They are somewhat analogous to those which belong to the nerves, but are distinguished by the circumstance, that the latter, the nervous pains, dart or shoot along the course of the nerves, while those under consideration move in every direction, and are connected with inflammation.

and lymph in such quantities, as to separate parts, cause tissues to give way, and prevent the inosculation of vessels, new or primitive, which may shoot into, or be formed in the effused fibrine, whose first function, if they do not inosculate, is to secrete pus. At or about the same time when these sensations are experienced, the pulsatile, or throbbing pains, become more severe,† which arises from the increased resistance of the capillaries immediately preceding the relaxation of the pores; soon after which the throbbing may be expected to abate, for the effusion of lymph and serum depletes the vessels. Taken in connection with other coëxistent symptoms and circumstances, this abatement is a sign of suppuration. When suppuration has actually taken place, the sharp shooting pains, and the throbbing, are in a greater or less degree exchanged for a dull, heavy sensation, and often by a sense of weight, especially if the quantity of matter is large. As the matter accumulates, a sense of distention, caused by its pressure, is perceived, and is more especially appreciable on the side nearest the surface. The patient, if particularly interrogated concerning his feelings, in respect to these points, will inform you that there is not only a sense of weight as has been mentioned, but also a sensation as if there was something pressing from within outward, and distending the parts, as if endeavoring to escape.

## 2. INCREASED HEAT.

When matter has formed, the sense of heat, of which the patient complained, actually diminishes; but whether there is really any lowering of temperature ascertainable by the thermometer, I am unable to say; but I have often observed, that it feels less hot to the hand than before. When suppuration is considerable, the patient will occasionally experience a sense of coldness, as well as of weight in the part, but may not mention either, unless his attention is called to them.

## 3 REDNESS.

The color of a part being dependent on the fluids which it or its vessels contain, explains, or tends to explain, why the increased redness

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† This throbbing or pulsatile feel may, to a certain extent, depend on increased intensity of the heart's action just at that point of time, and is evidence of the contest between the *vis a tergo* and the resistance of the capillaries, or their pores. When the former (the *vis a tergo*, or action of the heart) abates, the latter will forego their resistance, and the serum and lymph be poured out.

(one of the phenomena of inflammation,) begins and continues to fade as the suppurative process advances. It first verges towards a scarlet; then becomes more diffusive, and gradually paler and paler as the matter approaches the surface, until the skin directly over the immediate seat of the abscess assumes a dingy white, contrasting well with the surrounding red.\* If the increased redness is a symptom of inflammation;—if the secretion of pus, or perhaps, more properly speaking, the effusion of serum and coagulable lymph empties the vessels and cures that disease, it cannot fail that, on the occurrence of suppuration, there should necessarily be some modification of that symptom.

When the process of ulceration commences immediately after the formation of matter, the change of color is not so apparent. Instead of changing to a scarlet, it becomes crimson. Again, when matter has formed and the color in a marked degree become paler, it has resumed the crimson as soon as the ulcerative process began. Crimson is indeed the color of ulceration. The change from a deep to a paler red is owing to an effusion of serum into the cellular texture of the parts between the surface and the contents of the abscess. The change to a crimson, when the ulcerative process has been set up and is going on, arises from the absorption of serum, leaving the vessels turgid with blood, which, from its delay in these vessels, has assumed somewhat the venous character.

#### 4. TUMEFACTION.

When inflammation is progressing the tumefaction also increases; but when suppuration commences, the swelling commonly begins to subside. While as a whole it has lessened, some portion of the inflamed part may appear, and often is actually more protuberant or “pointed.”

The swelling may be likewise modified in respect to its hardness or softness as well as uniformity. The centre or focus, where the inflammation has been most intense, and where the pus is in greatest quantity, is soft compared with the margin which is hard and firm in consequence of the effusion and organization of the coagulable lymph, which has

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\* For want of due attention, this change of color has been mistaken for a sign that resolution is about to take place—a fact which furnishes a caveat to the young surgeon not to make up his mind and come to a conclusion, even in trivial matters connected with professional affairs and pursuits, without taking all the attendant circumstances into the account. To be mistaken, in regard to the existence of matter, seriously compromises the professional character of even an old practitioner.

served as a barrier to confine the matter. The organization of this barrier converts it into a cyst, whose inner surface continues to secrete pus, which is thus confined to the cavity into which it was at first secreted. Beyond this cyst and barrier, on every side where the inflammation was less, serum is effused and sometimes perhaps albumen;—the same thing also happens between the cyst and the external surface; hence the œdema and pitting not only all around the collection, but absolutely between the matter and the skin, and not unfrequently in the latter. We have sometimes found this œdema so great as to obscure the sense of fluctuation, even when the quantity of matter has been considerable. When all the other symptoms are in keeping, this œdema is one of the surest signs of the existence of matter; it depends on the very necessity of the case:—for if lymph is effused in sufficient quantity to be followed as we have shown by the secretion of pus, the effusion of serum, upon which the œdema depends, will be still more copious and extensive.

The foregoing constitute the modifications of the phenomena, and comprise the local symptoms which indicate the existence of matter; but there are changes involving more or less the whole system, which are also symptomatic of suppuration, with which the practitioner should be familiar; because matter sometimes forms in situations or under circumstances which preclude the possibility of making the fore-mentioned criteria of its existence available;—we are then obliged to resort to other phenomena as evidences of its existence, amongst which is

#### THE RIGOR OR CHILL,

Which, time out of mind, has been noticed in this connection; but the true nature of which has not been, to the knowledge of the writer, very satisfactorily explained, or its connection with the thing signified, very clearly traced out.

In order to understand this matter fully, it should be recollected that the cutaneous capillaries are the only vessels designed by nature to be ordinarily subjected, to any great extent, or in any considerable degree, to the influence of temperature, and are therefore the only ones which do experience and take cognizance of changes induced by its vicissitudes. The application of cold, or rather the abstraction of caloric, produces a contraction of the capillaries of the skin, and indeed sometimes of other parts, so much as sensibly to diminish the size of a limb. The perception of change produced by this contraction of the capillaries, especially of the skin, constitutes the sensation of coldness,—a certain

sign that that particular action is going on, no matter how induced ;—shrinking of the cutaneous capillaries being all that is requisite to produce that sensation, or the chill. Now then, how is the shrinking occasioned, which is indicative of the existence of pus ? As soon as matter is formed, a portion of it is absorbed, and passes into the general circulation :—coming thus in contact with the inner surfaces of the capillaries, which are rendered preternaturally sensitive by the prevalence of the phlogistic diathesis, it (the matter) makes on them a strange and novel impression, and stimulates those vessels to contract, partially, perhaps at first, if the quantity of matter absorbed is small—in which case a mere chilliness is felt ; but soon as the quantity is sufficient to produce a general shrinking, a complete rigor\* is experienced, which resembles the cold fit of an ague, and is not unfrequently followed, as in that disease, by the hot and sweating stages.—Hence the flashes of heat and colliquative sweats in hectic fever. If, as suggested, the quantity of matter is small, a slight chilliness or chill may be produced—if it is allowed to remain and increase, the shivering will be repeated from time to time, with an intensity proportioned to the augmented quantity of matter, until a full rigor is experienced. When repeated again and again, the chill is a sure sign, other symptoms being in accordance, not only that matter is already formed, but that a portion has been absorbed and carried into the general circulation, and like imperfectly assimilated chyle makes a strange, novel and disagreeable impression on the inner surfaces of the capillaries, causing them to

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\* The stomach, rectum, uterus and bladder may be considered as capillaries of enlarged dimensions, whose actions, commensurate with their size, are easily and readily comprehended, and therefore well adapted to illustrate the manner in which that order of vessels perform their function. All are familiar with the fact, that the expulsive efforts of these organs, if abnormal in a slight degree only, are attended with a sense of chilliness, especially in sensitive persons, which goes off as soon as their contents are expelled. In some instances it ceases when the sphincter relaxes and the evacuation commences, and always when the organs forego their contractile effort, whether emptied or not. The same thing may be observed in people of weak and irritable temperament, whose digestive and assimilative powers are imperfect. The patient, in such cases, not unfrequently experiences a sense of chilliness almost as soon as the food is received into the stomach, but oftener after the lapse of an hour or two, when it is a sure proof that the processes of digestion and assimilation have been incomplete ;—that imperfectly formed chyle, taken up by the lacteals, has found its way into the general circulation and is making a strange, novel and disagreeable impression on the inside of the capillaries which causes them to contract—hence the sense of chilliness.

contract; hence the chill or rigor, which is so often repeated when there are large abscesses or continued ulcerations in important organs.\*

### FLUCTUATION.

The most unequivocal sign of the existence of matter is fluctuation, which should ever be taken in connection with other symptoms or changes indicative of suppuration; for surgeons, who have relied on it exclusively, have found themselves now and then mistaken, and their reputation injured. In malignant affections of the joints and other parts, and encephaloid tumors, we are particularly liable to be deceived, because the sensation communicated to the fingers is so exactly like that felt when matter actually exists, that it is not only difficult, but next to impossible, to discriminate between them without taking into the account the history of the complaint, and all the attendant circumstances. To ascertain by fluctuation,† the existence of matter when deeply situated, or under muscles and fasciæ, as in the neck, thigh, or perineum, often requires a good share of the *tactus eruditus*, which experience alone can give. The manner of feeling for matter is by no means unimportant. Some surgeons employ two fingers of the same hand, placed upon the abscess a little distance apart, when a slight tap is made with

† After injuries of the head these chills and shiverings are “portents dire”:—they are almost the only signs by which we judge of the existence of pus within the cranium, requiring the trephine—the only agent by which the unfortunate patient can be saved, if indeed he can be then saved at all. In connection with inflammatory affections of other internal organs and deep-seated parts, they are of the highest importance. In such cases they should always be most seriously taken into the account when making up our diagnosis and prognosis, without forgetting that the chill is sometimes caused by simple irritation.

\* Undulation is sometimes mistaken for fluctuation. In the encephaloid tumor or disease, the former is the movement which is so deceptive. For example, the mass, pressed by one hand, is moved by that pressure in the opposite direction, and seems to strike against the other with an undulatory motion, which is often mistaken for fluctuation;‡ whereas, in fluctuation, the fluid so pressed, not only impinges against the hand, but can be felt passing or sliding as it were along beneath it.

‡ A similar undulatory movement of a very deceptive character is often perceived, when an attempt to feel for matter in a limb, is made in a transverse direction, the muscles and tissues being pushed from side to side, cause the sense of fluctuation, which is so apt to deceive the surgeon who remains satisfied with this mode of examination. To correct any misapprehension, the trial should be likewise made in the longitudinal direction; if fluctuation is then discovered, the case is clear.

one,\* while the fluctuation is felt by the other, and vice versa, until all parts of the impostume are examined. Others employ the fingers of both hands in the same manner. The writer's method is to lay the fingers, or the whole hand, (supposing the collection extensive or deep under fascia or muscles,) as the case may be, upon the skin, and press so firmly as to force the matter away from under it, and then apply the other hand or fingers to another part, and press so as to force the matter back under the hand first applied, which being gently eased up, will not only feel the impulse of the matter, but perceive it passing along under it.

If the examination be made by the alternate depression and elevation of the hands, thus relatively situated, there will be felt not only the sense of fluctuation, but the sensation of something moving or sliding back and forth beneath the fingers of either hand; generally this movement of the matter will be more sensibly and satisfactorily perceived by one hand than the other.

In more doubtful cases, when settling this important question of the existence or non-existence of matter, we should take into consideration the duration and severity of the disease; for one greatly dislikes to be mistaken. The effusion of coagulable lymph, the indispensable prerequisite to the secretion of pus, necessarily requires some time, before it can be accomplished in such quantity as to prevent the inoculation of the new vessels, by which the pus is secreted; therefore, the length of time required for matter to form, will be greatly influenced by the structure of the part affected. In inflammations of ordinary character and degree, when confined to the cellular membrane and in healthy subjects, these preliminary changes will be completed in from thirty to fifty or sixty hours, provided they have not been much interfered with by the surgeon or his remedies, so that in the course of the third day the secretion of pus may be expected to have commenced, and probably to have made a decided progress, and in one or two days more the impostume may be fit for the knife.† There is, however, so much variation in regard to time, that it will not be safe to place much dependence on it; but in doubtful cases it is proper to consider it.

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\* Percussion furnishes a very delicate, and the exploring 'needle a very certain test; but they are not available in every case. In relation to the latter, I would say that the surgeon should have recourse to steel as rarely as possible for solving doubtful questions.

† Suppurations on the head, or in the mouth, particularly in connection with the gums, take place very early, often in twenty-four or thirty-six hours. A fig, roasted or unroasted, taken into the mouth, and applied to the part, acts as a poultice, and is the best remedy that can be employed in such cases.

We are often inquired of whether this or that inflammation will suppurate? Now, if the shooting, darting pains have been decidedly felt, other circumstances being in accordance, we may reply that such will be the probable result. It will be most prudent, however, to give a guarded prognosis. When the lymphatic glands in the neck or axilla inflame, especially in children, and the disease has advanced so as to discolor the skin, we may be pretty sure that suppuration will ensue; but before the skin is involved, we may hope to discuss the tumor.

Summarily:—The changes in the sensations, color, tumefaction and temperature of the part; the chills, shiverings, rigors, flushings, and other phenomena, together with sensible fluctuations, comprise the evidence on which we rely for determining the existence of matter.

#### MODIFICATION OF MATTER.

Having glanced at the importance of attending to symptoms, as modified by the structure of the part affected, we will now briefly consider the modifications of matter from the same cause. When pus is the result of inflammation in the cellular texture, it is yellow, rather inclining to white; about the consistence of cream, not transparent; without acrimony, and when cold, inodorous. When secreted from mucous membranes, it is seldom pure; being mixed with mucus, it has a greenish yellow, as in catarrh, gonorrhœa, &c. When muscles are involved, it is more yellow. In the serous membranes, it is blended with serum, and constitutes the sero-purulent fluid, with flocculi of coagulable lymph floating in it. If the inflammation in them has been high, we find large flakes, or even cakes of fibrine, as well as small flocculi; if still more intense, the effused fluid has more or less the appearance of blood, which denotes that the *vis a tergo* has not only been violent, but unsubdued; occasionally all these varieties may be observed in the pleura, pericardium, peritoneum, and even the pia-mater. If the suppuration has been in a bone, or a bone has been involved, the matter is fetid, grayish, sometimes containing globules of oil, and gives a dark stain to the dressings or a probe. Although the abscess may have formed on and laid the bone bare, even to a considerable extent, yet if the matter is thick, ropy and of a whitish green or yellow color, and free from particles of oil or blood, I am always inclined to give a favorable prognostic in relation to the preservation and integrity of the bone itself.

The pus formed in the liver is almost unique in appearance, reddish, thick, and not unfrequently mixed with streaks of pure yellow, which I

have supposed to be bile. Even when expectorated, after having found its way by ulceration, into the bronchia, and traversed the lung, it retains this appearance: Moreover it is sometimes so horribly offensive as to fill the whole house with its odor, so much so that I have more than once formed an opinion of the nature of the case the moment I entered the door.\*

The degree as well as location of the inflammation may be inferred from the properties and appearance of the matter; for instance, if it has been violent the matter may be sanious or even bloody;—if much below the ordinary degree, as in scrofula, it will be thin, somewhat like serum or whey: thus the appearance of matter may be turned to good account when making up a diagnosis or prognosis.

#### USES OF PUS.

In the production of pus we have a fluid whose office is to keep the granulations moist, and by its evaporation prevent their inflaming. It is nature's cerate. Besides floating bodies out of wounds and abscesses, its secretion may possibly tend further to empty the vessels and finish the process commenced by the effusion of fibrine and serum.

For some remarks on the treatment of abscesses, see Appendix.

#### OF ULCERATION.

According to the doctrines set forth in these papers, neither mortifications, scirrhus nor even ulceration, is to be considered a termination of inflammation.

Nor is ulceration a necessary accompaniment or sequel of suppuration; but a process set up *de novo*, after the inflammation (when connected with that disease) is cured by effusion or otherwise. It sometimes occurs without previous inflammation, and sometimes quite independent of it. It is the work of the absorbents, and appears to be induced by causes which modify or interfere with the nutrition of the part.

To be absorbed, solids must become fluids. We are not aware that any solid part of the body becomes a fluid during life without having

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\* This horribly offensive smell likewise attends gangrene of the lungs—the history of the case will always lead to a correct diagnosis. Notwithstanding the extreme danger, the patient in both instances, according to my observation, generally recovers. When the abscess forms in or near the upper part of the liver, and the matter ulcerates through the diaphragm and lungs, it seldom has this offensive odor. Its course and channel through the lungs may sometimes be quite accurately traced by the help of the stethoscope.

lost a portion of the vital affinity by which its constituent molecules are held together, and enabled to resist the play of chemical affinities. In most instances, parts when they become useless, are taken up by absorption without being apparently subjected to chemical action.

The interdict, "ye shall not eat if ye will not work," covers the whole man: hence every fibre or tissue which ceases to be useful in the economy, ceases to be duly nourished, and is consequently absorbed without ulceration; that being unnecessary to accomplish the object—the removal of the useless part.

Pressure or mechanical distention of some kind or other is the most generally exciting cause of ulceration. This pressure may be of two kinds. 1. A greatly distended state of the capillaries of the part by the fluids which they contain.\* 2. A mechanical distention which operates on the tissues in common, and on a considerable portion of their capillary vessels. From these two kinds of pressure arise two varieties of ulceration: 1. When both exert an influence, as in inflammation and suppuration. 2. When either alone acts. In the first variety, the nutritive process is interrupted by the general distention produced by the effused fluids and the absorbents are also stimulated, by the same cause, to increased action, while the capillaries are likewise so much over-distended and stretched as to experience a diminution of the resistance afforded by the vital affinity which might have enabled them to have resisted longer, and perhaps with ultimate success, had it not been for the general distention and pressure, which not only increases their ordinary tension, but forces them out of their natural direction—contingencies which, in all their bearings, tend to weaken the nutritive process. As an example in point, I would mention an abscess in which the matter presses from within outward on the capillaries most distended by their own contents, and also by the matter pressing and urging its way to the surface, which forces the fore-mentioned capillaries to yield to the combined agency of these two causes. In this condition of things, absorption goes on with energy in different parts—internally nearest the matter, and also at the surface.†

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\* Ulceration in the skin and mucous membranes—surfaces communicating with the external air, is generally caused by this species of pressure. Perhaps in strict technical language, the term *ulceration* should be confined to the lesions it occasions in those tissues.

† This last circumstance most frequently occurs in scrofulous abscesses, in which several openings are made by ulceration, through which the matter escapes.

In the second variety, the capillaries being merely over-distended, (the general distention absent,) lose their vital affinity and give way. This variety most frequently occurs in constitutions vitiated by a cachectic condition of the fluids, as in scurvy; in newly formed parts as granulations, etc.—in limbs long affected with varicose veins, varicose ulcers, etc.; in such cases the destructive is more rapid than the reparative process—indeed the march of destruction is sometimes frightful. I have seen more mischief from ulceration in forty-eight hours than could be repaired in several months, by the restorative powers of nature, aided by the most skilful surgery. Ulceration is generally preceded by inflammation and suppuration, but not always, as in some cases of tumors, aneurisms, etc. Some textures, more rapidly than others, take on the ulcerative process, as the skin and mucous membranes. In the latter it is, I believe, invariably produced by inflammation.

The most remarkable feature in the process of ulceration is its tendency to advance most rapidly on the side nearest the surface. On the proximal side, the tendency is reversed. The structures on that side, instead of becoming thinner and thinner, increase in thickness and density. This may be explained upon the principle that the vital powers are stronger on the proximal than on the distal side, and that pressure, if slight, will produce a thickening of the part experiencing it; but if strong enough to make a forcible and disagreeable impression, it will impair nutrition, promote and often cause absorption; and if to such pressure inflammation be superadded, ulceration will be the certain result. Pressure, either general on all the textures of a part, as from matter within an abscess, or from the over-distention of the capillaries, is the most common, if not the only cause of ulceration, especially of that connected with inflammation. Irritation also has been regarded a cause; for irritation produces a determination of fluids to the part in which it is seated, and induces a distended state of its vessels, which, if much weakened, are unable to resist the distending force, and therefore give way—ulcerate. Debility may be very justly considered as the predisposing cause.

What is the final end of ulceration? Strictly speaking, it is to rid the system of useless or offending matter, whose presence cannot be tolerated, but which cannot be taken up by the absorbents and eliminated through some of the emunctories—as pus, extraneous bodies, extravasated fluids, in considerable quantities, and even parts which have become useless, although these are commonly removed by the absorbents without ulceration. The detachment of ligatures from an artery,

or of dead from living parts, as in sloughing, could not be effected but by the process of ulceration.

In practice, it is important to remember, that some tissues and structures resist the ulcerative process much more stoutly than others, as tendons, aponeuroses, etc., for obvious reasons. Allied to ulceration is gangrene or mortification, which occurs when the disease (inflammation) is so intense that the capillaries, in some portion of the inflamed part, become so much distended, or over-distended, and act so vehemently that the pores will not relax, and consequently effusion either not take place at all, or only in a quantity too small to empty and relieve the vessels, which from over-distention and painful resistance lose their vitality; in other words, they resist until they die, which constitutes the gangrene, in which inflammation is said sometimes to terminate, the consideration of which we shall omit.

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## APPENDIX.

### TREATMENT OF ABSCESS.

When an abscess has formed, the rule of practice is, in general, to imitate nature, and let the matter out. She does this by ulceration—the surgeon does it by incision or puncture. If the abscess is large, and somewhat chronic, its cavity, when emptied of the matter, should be filled to a moderate degree of distention with a solution of corrosive sublimate, ten or twelve grains to the pint, thrown in with a syringe, and allowed to remain a longer or shorter time, according to the uneasiness or pain it occasions, when it should be gently squeezed out, and the sides of the cavity be brought as nicely in contact as possible, and kept so by well-fitted and applied compresses and bandages, and the whole kept wet with water, cold or tepid, as is most congenial to the feelings of the patient. In this way the writer has cured many abscesses in a few days, and occasionally those of an acute character in a single day—the whole interior surfaces laid and kept in contact, have adhered and healed by the first intention, without another drop of matter being discharged.\* No case has come to his knowledge in which unpleasant consequences have resulted from this

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\* The tincture of iodine is an excellent substitute for the bi-chloride of mercury. I have seen it used in the N. Y. Hospital, by Dr. Buck, for the cure of suppurated buboes, with very happy results.

method of treatment. Often, indeed, many abscesses may be speedily healed when thus treated, which if managed in the common way would have taken months to cure, or perhaps have cost the patient his life.

It was formerly supposed that the admission of air into the cavity of an abscess was the cause of the inflammation which so often came on about the third day after the evacuation of its contents; this opinion is now pretty much abandoned; but no very satisfactory explanation of the fact has been given. The writer ventures to give the following: By the withdrawal of the matter the vessels of the cyst, and those about it, relieved of the pressure which it caused, are soon filled and over-distended with blood, to a degree which stops the secretion. This process requires about three days, for the effusion of lymph and the secretion of pus, after which the abscess continues to discharge good or ill-conditioned matter for a longer or shorter time. Now, by using the injection as proposed, we anticipate nature's process, and produce a new inflammation and effusion of coagulable lymph, by which the surfaces are glued together, and in which new or primitive vessels, shooting from side to side, inosculate and cause the abscess to heal like a wound, by the first intention; thus the secondary inflammation,\* to which we have alluded, and which so often comes on a few days after the evacuation of collections of matter, is prevented, and the patient saved from all the hazard and suffering incident to such an occurrence.

In chronic abscesses, in which the secretion is vitiated and the constitution cachectic, the injection of the solution of the corrosive sublimate is the most important remedy, especially when associated with the internal use of cantharides, either in tincture or substance—gradually increased so as to produce strangury—the only sign by which we know that the system has been brought under its influence, just as mercury is known to have affected the constitution, when its specific effects are manifested in the gums. The strangury thus induced is immediately removed by the single introduction of a catheter; or less promptly by the spirits of camphor in sweetened milk, frequently repeated. The use of the medicine should be suspended—and resumed when the strangury has left, taking care to begin with a diminished dose, *i. e.* somewhat less than that by which the specific effect was produced.

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\* When the abscess is large the inflammation is dangerous from the extent of inflamed surface, and the secretion which follows is almost always of a highly vitiated character, especially if the constitution is bad or much weakened.

